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# Journal

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*of the association for physical  
and mental rehabilitation*



NOVEMBER-DECEMBER 1952

Vol. 6, No. 2



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# THE IMPORTANCE OF PHYSICAL MEDICINE REHABILITATION TO THE MEDICAL PROFESSION\*

JOSEPH C. GRIFFITH, M.D.

President-Elect, The State Medical Society of Wisconsin

Father O'Donnell, Mayor Zeidler, Mr. Berner, Mr. Fleming and members of the Association: I know that George Reichle has spent a great deal of time arranging this convention. He apparently has done a very efficient job, probably just as good as the one that's going on in Chicago, and as a rival to your convention right now. I think yours must be a very important organization because I've never accepted an invitation to a convention that's provoked quite as many letters as the invitation to this one did. One of the letters that I read, which I understand was sent to one of your organizations, was that you men, or you boys, I think it said, are traveling entirely too fast. Well listen; back in 1925 a great American Clinician, and somewhat of a medical prophet, Dr. William Mayo, said that, "Rehabilitation is to be a masterwork in medicine." That's 27 years ago, and I wonder if any of us are traveling too fast. One of your very good friends, a world figure and Elder Statesman, Mr. Bernard Baruch, said several years ago, "To develop the field of Physical Medicine, you must first train teachers." Now what both of these men have said is really coming to pass. There are outstanding teachers in this field at many of the great universities. There's one at Wisconsin, at Minnesota, at Michigan, Ohio State, at Washington University in St. Louis, in the Ivy League at Yale, oh, and many others — Kansas, Southwestern, George Washington, New York University, the Medical College of Virginia, etc. Our own university, my own university, of which we have the privilege of having its President here with us today, Father O'Donnell, is going to have a school of Physical Therapy, come this fall, and one of your members is to be its Director, Dr. Piaskoski. I understand that you Corrective Therapists are following Mr. Baruch's advice and have an excellent set-up at Columbia University and the Bronx Hospital. The American Medical Association has recognized the field, and they have a Counsel on Physical Medicine and Rehabilitation. They have a Section on Physical Medicine and Rehabilitation, and they have an American Board of Physical Medicine and Rehabilitation. So the field is being recognized, and progress is being made:

Now where does this group fit into the picture? I believe that many of these letters that we all received are because of misunderstanding. I am very glad to know where this group fits into the field, and I am certain there's a need for you, like there is for the rest of us. The specialist in Physical Medicine is the Physiatrist. And along with him come his ancillary helpers, the Occupational Therapist, I have a daughter who's one, but as soon as she was well-trained, and I was very proud that she graduated cum laude, then she gets married and is out of circulation, but anyhow, what's more important? The Physical Therapist, and the directors and officers of reconditioning, and Corrective Therapists, and I can see very well how that fits into the complete practice of medicine.

The subject of this little talk is the importance of Physical Medicine and Rehabilitation to the medical profession. Well, since time immemorial the medical profession has been dedicated to the curing of the ills and ailments of people. We are doctors because we are fond of people who are in trouble. I often wonder why we couldn't have found something easier, but there's a great reward, just like there is to Father O'Donnell or to Mayor Zeidler, who is so proud of his city.

If an illness, an accident, or an injury is to be entirely cured, we don't like to leave the patient when the acute stage is over. The patient has to be brought back to a normal way of living.

When I was a boy, the game was to have 8 hours work, 8 hours recreation, and 8 hours sleep. Well I don't know just how the hours fit, but at least the principle is right. To a person who has been in an accident, or has had an operation, he isn't entirely cured, until he's as nearly normal as possible. That makes for happiness. Often when you're working too hard, you're working for the day when you can retire, but did you ever see an industrious man who is happy entirely retired? That's all right for the lazy fellow. He never did anything in the first place! But a man who completely retires, they say, doesn't live long. At least he doesn't live happily, very long. There's at least that amount of good in all of us that we like to be doing something useful. So rehabilitation is very important to us as doctors.

Now there's another field, and that is, people are living longer and longer. Just look at life expectancy.

\*Presented at the Sixth Annual Clinical and Scientific Conference at Milwaukee, Wis. July 8, 1952.

Do you know that in the days of the Roman Empire, the life expectancy of a man was 21 years? And if there are any of you here that are 22, in the days of the Roman Empire, you'd be living on borrowed time. Well in 1850, in the United States, life expectancy was 40 years, in 1900 it was 47, in 1930 it was 60, in 1940 it was 63, in 1950 it was 67, and in 1952 it is 67.2 years. That's life expectancy. Now, of course, that's all influenced by war and famine and pestilence, child and infant mortality, etc. But people are living longer and longer. At present there are 10,500,000 people in the United States over 65 years of age. Now, do we want these people to become a problem? Industry has always placed a premium on youth. But industry must be taught to find a place for age and experience and faithfulness. It will make for a better America.

Now, come the age of 65, and even before, we are subject to the degenerative ailments—Arteriosclerosis, Heart Disease, Arthritis. So, this whole subject, besides being a matter of concern to the city, the state, and the country, is a concern of ours. Certainly Social Security can hardly take care of all these people, and

if it did, they wouldn't be as happy as if they were doing something for themselves. So it's a challenge to us, the medical profession, and it's a challenge to you, and to all the various members of this entire field—the Physiatrist, the Occupational and Physical Therapist, and the Corrective Therapist. You come in here too, to keep these people working as long and happily as you can. And we'll be doing something for the future of the world.

That is about all I have to say. I don't really believe you're going to take over the medical profession. If you do, then take over the hours too, and don't drop the knife when the whistle blows! I think that we still want to be both coach and quarterback to our team. Now don't think that we aren't like many places, looking around for a good fast halfback this time of the year to take those lateral passes and pitch-outs and carry them down their side of the field, your side of the field, to the goal that we are all looking for.

So, have a good convention. Enjoy the Milwaukee that Mayor Zeidler spoke to you about.

Thank you very much.

## EXCERPTS FROM PANEL: BASIC CONCEPTS IN REHABILITATION

*Editor's Note: Space does not permit inclusion of all that was recorded at this first session of the conference. The following topics were presented in this panel.*

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MR. FLEMING: I want to introduce Dr. Ray Piaskoski, Chief of the Physical Medicine Rehabilitation Service, Veterans Administration Center, Wood, Wisconsin. Dr. Piaskoski.

Dr. Ray Piaskoski, Chief, Physical Medicine Rehabilitation Service, Veterans Administration Center, Wood, Wisconsin; Director and Professor, Department of Physical Medicine and Rehabilitation, Marquette University, School of Medicine, Milwaukee, Wisconsin: Mr. Chairman, members of the Association for Physical and Mental Rehabilitation, and guests: I suppose I could say Democrats because I am sure all the Republicans are down in Chicago

or glued to television. You have chosen a week that is going to give you quite a bit of competition because, in addition, there is the all-star baseball game in Philadelphia today, and I think it is quite a tribute to rehabilitation to see so many of you present. Dr. A. B. C. Knudson, Chief of the Physical Medicine Rehabilitation Service of the Veterans Administration at Washington, was originally scheduled to conduct this panel. Unfortunately, he finds it impossible to be here and he has asked me to extend to you his sincere regrets and best wishes for a most successful meeting.

The purpose of this panel is to discuss "Basic Concepts of Rehabilitation." I shall briefly outline these basic concepts as I see them, following which, the other members of the panel will discuss in some detail how their particular field contributes to the total rehabilitation process.

Chronic illness and disability has been termed American's No. 1 medical problem. About three years ago more than 800 medical and community leaders meeting in Washington emphasized the extreme need for expansion of rehabilitation services to meet this problem. They stated that each year over 250,000

men and women are so disabled to injury or disease that they become incapable of holding jobs or of enjoying a normal life; that altogether there are many millions of handicapped people in the United States today; that between 1½ to 2 million of these people would benefit greatly from rehabilitation services. In the present state of our knowledge, physical medicine and the newer rehabilitation techniques developed during and since the recent war offer the most effective means we have for restoring these people to a useful life.

The Council on Physical Medicine and Rehabilitation of the American Medical Association defines rehabilitation as the process of restoring the handicapped and returning them as useful members of society at the earliest possible moment. Dr. Howard Rusk defines it more dramatically as teaching the patient to live and, if possible, to work with what he has left. The primary objective of any rehabilitation program is, of course, to restore a patient to the status he occupied prior to his illness or injury. But the cardiac, the arthritic, the hemiplegic, the amputee, or any other severely disabled patient may not be able to return to his old job. He must be trained for some new vocation within the limits of his abilities and disabilities. Some patients may be so severely disabled that they may never return to competitive employment. They may, however, contribute to their own support by working in a sheltered workshop or by carrying on some useful activity at home. Others, with even greater degrees of disability, may not be capable of any remunerative work. But many of these people can at least be taught to care for themselves and their daily needs, thus relieving the family or the community of the necessity of providing nursing care.

We are all aware of the remarkable ability of the human organism to compensate for loss, or loss of function, of a part of the body. Dr. Kessler tells of one of his patients who lost his right hand and learned to write with his left hand. He lost his left hand and learned to write with his toes. He lost his legs and he learned to write by holding a pencil between his teeth. The general pattern of the writing was the same in each instance, indicating that writing is a function of the total person and that the hand or the foot was merely the instrument for carrying out this function. Numerous other examples of compensatory abilities developed to a high degree can be cited. We have all seen them: Harold Russell, Miss Keller, thousands of others. Such compensatory skills do not just happen. Many patients will develop such abilities by themselves, but they will develop them more certainly and in a shorter time under skilled and experienced supervision and instruction. Many therapists have developed to a very high

degree the faculty for teaching such compensatory skills.

Today rehabilitation is accepted as an integral part of good medical care. To be successful it must begin from the very moment the patient comes under the care of the physician. It must be continuous and progressive through his entire illness, through the period of convalescence and until he returns to his job. The restoration of a severely disabled patient presents many complex problems—physical, mental, social, and economic, all of which must be solved if the patient is to be returned to a useful place in society. The solution of these problems requires the coordinated effort of many highly trained and experienced persons, including doctors, nurses, psychologists, skilled rehabilitation therapists, social service workers, vocational counselors, and job placement experts. Labor and industry, too, must play a part. Teamwork is the most important single factor in the success of any rehabilitation program, and a physician must accept responsibility for directing the rehabilitation team. He alone is qualified to determine whether or not rehabilitation is feasible for a patient and what the rehabilitation objective is to be. He alone has the training and experience to coordinate effectively what Dr. Knudson calls the synergetic factors in rehabilitation. The dictionary defines synergic or synergetic as acting together or in harmony, and synergism as the harmonious and cooperative action of two or more agents to produce an affect which neither alone can bring about. Just as the chemist adds certain reagents in certain amounts to bring about a desired reaction, so the physician prescribes specifically the amount and type of a therapeutic agent or procedure which will produce the desired effect, the maximum restoration of a patient. A well organized, smoothly functioning, dynamic program of rehabilitation can salvage many severely disabled patients who otherwise would be doomed to a wheel chair or bedfast existence. At this time, I would like to call upon Dr. Florence Mahoney. Dr. Mahoney is Chief of the Physical Medicine Rehabilitation Service at Kennedy Veterans Administration Hospital, Memphis, Tennessee. She will discuss "The Approach of the Physiatrist to Rehabilitation." Dr. Mahoney.

DR. FLORENCE I. MAHONEY: Mr. Chairman, ladies and gentlemen: You have heard part of my talk through previous introductory remarks by some of the other physicians. This type of program necessarily will interlap one with the other, but, as I see my role in this particular panel, I am going to try to point out to you the things which I feel are important in our role as physical medicine rehabilitation people in this business of rehabilitation. It has been mentioned that Physical Medicine is a new specialty. Because we are a new specialty, there are many con-



cepts as to where the emphasis should be placed. Where it will be placed depends upon the leadership and previous training of the physiatrist in charge, the kind of staff he has at his disposal, whether he has a large staff of therapists such as we have, and find most helpful in the Veterans Administration, or whether he has just Physical Therapy, let us say, and how experienced and trained the staff is and what kind of in-service training he sets up to train these people. Also, there is the type of load: In a chronic NP hospital or a TB hospital, or a large GM & S hospital with a paraplegic center, as we have at Kennedy, the size of the patient load per staff member will be quite different.

I would like to mention just a few basic things that I believe are most important to this field of Physical Medicine Rehabilitation in which we work. First of all, we must have a true concept of total patient care. If we do this we must think, of rehabilitation as a problem not only for us, but also for all those who work with the patient. Therefore, we must think of it in terms of each section of Physical Medicine, if we are fortunate enough to be where there are at least the five therapy sections, such as we have in the Veterans Administration. We must also think in terms of how we fit in with the other medical specialties. On this panel we have many groups represented, but we do not have medicine represented in itself or its many specialties, nor surgery or its specialties. We must fit in with them in order to get along.

At our hospital we do not divide the patient into parts. We have a hemiplegic treated in all the sections that help him. I see no reason why a hemiplegic patient needs to have heat and massage and passive exercises in one place, with a bilaterally coordinated type of exercise in another section. To me, he needs to have a bilateral exercise all the time, and he needs to start his self-care program the minute the physician lets us get to him. In our hospital we get them early.

Then, too, we must set goals, which constitute the other point I want to make. Our job in Physical Medicine is to help set the goal for the patient and then help him reach this goal. I think this point will be brought out a little later. We do not rehabilitate the patient. He works at it himself. We point the way. My job as a physician is to set a goal, re-evaluate and re-set that goal so that, as we go along, he can attain one goal, set and attain another one without, if he is a severely disabled patient, getting discouraged. If we are fortunate enough to get him early or right after an automobile accident, if he is a paraplegic or a quadriplegic, or right after the stroke, if he is a hemiplegic patient, that goal will not be very high at the beginning. But, as he goes along, he can reach the highest possible goal that

he can be expected to attain with his physical disability, his emotional response to it, and his drive to attain that goal.

We must set a goal that is possible. We must administer a treatment that is on a par with the medical or surgical treatment of that patient so that as we go along we teach physicians working in other fields how to use us to best advantage. This is the one thing re-evaluations can do, for, if you do them with the hospital physicians, with the nurses, with social workers and psychologists, with psychiatrists, everyone learns more about the patient, what we can do, how we can treat him better. What the final goal will be, of course, depends on what the patient wants to do.

I would like to say just one word about the problem of getting the patient back to work. It is much easier to get him to where he will go home than it is to get him a job. We have various techniques such as our vocational testing, contacts with social workers, and with vocational rehabilitation. But we have not as yet come to the place where we have industry sold on the fact that these men can work at some type of job or other. It is getting better. I think we must also keep in mind that the patient has to reach the point where he wishes to work, where he knows he can work before we can expect him to be placed on a job. Sometimes we push them a little too fast. We must set our goals at that level which the patient is ready to accept, or he will not go along with it.

**DR. PIASKOSKI:** Thank you, Dr. Mahoney. All of us working in rehabilitation recognize the value of motivation, the desire on the part of the patient to get well, to get back to work. Psychological and emotional factors play a great part in motivation. I would like to introduce Dr. D. Louis Steinberg, Superintendent, Elgin State Hospital, Elgin, Illinois, who will discuss "Emotional Concomitants of Rehabilitation." Dr. Steinberg.

**DR. D. LOUIS STEINBERG:** Maybe I should start by illustrating the emotional reaction and say that I heard a lot of things here this morning on which I do not entirely agree. That is my emotional reaction to the situation. I happen to be connected with a hospital for the mentally ill. From my personal knowledge over a period of about 20 years of rehabilitation, physical therapy, etc., has been going on there, and I know I did not start it. It was started some 80 years ago at the start of the hospital. I hope you do not misunderstand this remark. I think it is pertinent for you to know that this is not a new field. It is merely a development in the process of growth. And I hope in the future, rather than have a section on Physical Therapy, a section on Occupational Therapy, and a section on medicine—Dr. Mahoney's regret that a medical man isn't here, and the surgeon isn't here—that we will all meet for the

primary purpose of treating the patient, rehabilitating him, if he will.

The topic I am supposed to cover probably requires a couple of courses or years in a particular study. I think we are all familiar with emotional reaction. It is something we feel, which occurs at a time that something happens to us. In psychiatry we like to think of emotional reaction occurring at the moment a child is born. He has to adjust to frustration, and we do not want to go into the dynamics of that. As the child grows it must make adjustments, each of which requires an emotional reaction. The final process of maturity is the ability to delay the immediate gratification, which is a drive, a fundamental drive, until such time when it can be realized with greater satisfaction, or with greater pleasure, or more realistically. I think in talking about rehabilitation of the sick person—and you have to bear with me because my orientation is primarily toward the mentally ill person—but again I cannot divorce the two because I think the person who loses a limb, or a person who suffers from chronic disease has as much emotional reaction, as much feeling about his illness, about society, about his family as everyone else. You have to treat this, I think, in order to get the maximum result of therapy. Therefore, one has to begin to learn to handle the emotional reaction. This is the inter-personal reaction that goes on between therapist and patient. I do not think it matters whether it is in the field of surgery, a specialty, or in medicine. The sick person, whether he is maimed or otherwise, has a double-edged sword, you might say, to handle. He can remain ill and gain a tremendous amount of gratification. The therapist must be aware of that. I do not think there are any of us who cannot recall an illness at one time or another that we would not have just longed to prolong, depending upon the consolation of things at that particular moment. The therapist must be aware of this. He must also be aware of his own emotional reaction to the patient. And this starts again, first with our own orientation about ourselves and our orientation toward helping others. Why am I a doctor? Or why are you working with the sick person? Sometimes some people tell you it is so much more pleasant to work elsewhere with a healthy person. There must be certain needs about us. This inter-relationship with the patient and you is one of the most important therapeutic influences we have, but the therapist should be quite thoroughly aware of his own reaction so that he does not transmit to the patient certain things regarding his own attitude, regarding society's attitude. Whether it be a physical illness, an amputee, or a mental disturbance, he must not transmit to that patient his own feelings or society's feeling, which may actually bar or keep him

from doing the maximum for his patient. You must always bear in mind that the patient, I think, feels and reacts to stimuli. He is going to select from his environment those things which he thinks are going to give him greatest gratification. A sudden injury or a sudden accident might throw the patient into complete regression. We might actually have to rehabilitate him from childhood on, one might say. But you, as a therapist, must be aware of that. You must begin with the patient at the time when it is most opportune to stimulate his feelings to the point that he will be able to work with you in order to grow and develop. I think that is the most important part of emotional reaction.

Now, the reactions that may set in to various individual patients are based on their personality structure, on their ability to have functioned prior to the accident. I think too often—I am sure you do not forget it—you approach the patient with the idea that he must function; that he must get well; that he must work; that he must drive a car, etc. Maybe some amputee might be very happy not to have to undergo the rather rigorous stress and strain necessary to drive a car in present day traffic. Maybe he would accomplish just as much, if, after complete study and survey of the patient, it was decided that his personality structure was such that he would be gratified to begin some other type of activity. I use some rather extreme examples, but the point I want to make is that we should not project into our patients certain ideas of our own or what the patient has to do in order to think of him as rehabilitated.

You have heard some definitions of rehabilitation. I think the best definition is to return the person to function at the maximum level of efficiency for that particular person. These people were not all entirely well before they had their accident. We know that from mental illness. A patient has an acute mental break. He will come in and tell you so. But when you study the longitudinal history of that patient you realize that that patient has been struggling with the problem of adjustment for many, many years, and that this acute break is really the culmination of accumulated tension and anxiety. The only solution for that patient is a defense, and his defense takes on the nature of either a severe neurosis or a severe psychosis. Therapy should not be designed entirely to break down defenses until you, as a therapist, are ready to give that person—and he is ready to accept it emotionally, temperamentally, and as a personality—a better solution for the problem. I think this applies equally to the physically ill, the surgically ill, or any other person. I think these are the things I would like to emphasize in the matter of rehabilitation. Rehabilitation has gone on for many years, as I said before, but I think we are now reaching a



point where we can pinpoint and highlight and apply more specific techniques in rehabilitating specific people, not treat them en masse.

I will have to tell this story because I think it illustrates a thing about my own field. The superintendent takes around a visitor. The superintendent likes to show off his hospital. The visitor is curious. He wants to see what goes on. The superintendent brags about how much they do. He shows a man sitting with a fishing pole, goes up and asks him, "John, have you caught any fish today?" He did have a pan of water in front of him, and John, being supposedly sick, looks up at the superintendent, and, in a very blank expression, which a chronic mentally ill person very often has, points to the pan, and says, "In this, you damn fool?" I think that illustrates what I wanted to say about our need to understand emotional requirements of our patients and that we do not work in a vacuum, you as a corrective therapist, I as a psychiatrist, the surgeon as a surgeon.

No one person can do everything that is required for a patient. We all have our special skills. These skills should be correlated and directed towards the patient specifically for that patient's needs. When we do that, I think we won't need to discuss in separate sessions our problems. The emotional needs, I think, are no different in a sick person than the emotional needs of any person, depending on where the disturbance occurred, and that requires specific knowledge of development of personality growth, integration, motivation, goals, ego structure, super-ego structure—all the terms you want. It all boils down to knowing the personality and with what you can aid. You certainly would not want to rehabilitate a mental defective with an IQ of 70 to be a CPA. Anyone who tried it would certainly fail. I have given a very extreme example. The one thing I must emphasize is that the emotional needs of the patient should be gratified at times, delayed at times, depending upon whether we ourselves know what we are aiming for in the patient. Thank you.

DR. PIASKOSKI: Thank You, Dr. Steinberg: I would like to introduce Dr. J. Q. Holsopple, Assistant Chief, Clinical Psychology, Veterans Administration, Washington, D. C. He will talk on "Contributions of Psychology to the Understanding of the Patient to His Treatment." Dr. Holsopple.

J. Q. HOLSOPPLE, Ph.D.: Mr. Chairman, ladies and gentlemen of the Association. I want to express my pleasure and feeling of satisfaction at being permitted to represent psychology on this panel. I debated a little bit on whether to clarify the title before making my remarks. I thought perhaps a confused title might be more appropriate than a clear one. However, with time running short, I think we might get directly to the point.

One of the concepts of rehabilitation which has become basic in our current thinking concerns the role of the psychologist. It has become increasingly clear that a well trained, experienced clinical psychologist can make two important contributions. He can accelerate, broaden, and deepen the understanding of his colleagues from other disciplines with respect to the needs, assets, liabilities of patients in rehabilitation programs, and the probable outcome in particular cases. Moreover, he can directly help the patient himself to achieve that understanding of his treatment which is so important to success.

During the last fifteen or twenty years, philosophers and psychologists in the laboratories of many of our great universities, and psychologists in our clinics and hospitals have made real progress in coming to grips with many of the problems which interest us in this meeting. This is true both with respect to basic research and to its application. In later meetings you have planned to consider the more detailed participation of the psychologist in particular rehabilitation situations. In this panel I shall try to outline broadly the place of psychology in the total rehabilitation concept.

The first problem of mutual interest, and perhaps the most important, is that of motivation. Obviously any rehabilitation program for a patient must take account of what he wanted to do before his illness or his injury. It must take account of how realistic his old goals now have become. It must take account of new substitute or compensatory motivations which may help or hinder the rehabilitation process. Both the strength and the direction of motivations are important. And of especial importance is the fashion in which the motivations of the person are integrated into his total personality pattern.

I think we must admit that our present procedures are often based on a trial and error sort of attack, and we must take the position that progress requires a diminution in the frequency of error.

Toward this objective psychology can make a real contribution. From laboratories and clinics have come the assurance that we need not infer from the fact that a person "cannot," that he "does not want to." Nor need we wholly depend upon what he says about his motives for conclusions about what they really are. A man's most important motives are often vague or unrecognized by himself or even when known are concealed from his friends and his therapists. The clinical psychologist has tools and techniques for making such determinations and they are constantly improving.

Another problem of vital mutual interest is closely related to but not identical with motivation. That is the problem of learning. A century ago the nature of learning was defined for the most part simply in

terms of the more obvious, casually observed facts of learning. Good methods of teaching depended wholly on the intuitive and artistic abilities of the teacher. Fifty years later, under the pressure of scientific concepts derived from the mechanistic approaches of physics and chemistry misapplied to the human mind, learning was considered in terms of mechanical causal sequences. We tried to understand the learning processes in the live human rehabilitation setting in terms of the salivation of a dog, or the maze running of a rat, and we tried to locate the operations in the synapses between nerves. We now know that these efforts represented over-simplifications.

The final answers to the problems of learning are still probably a long way off. But it is no longer necessary to retrace in the teaching rehabilitation clinic all of the kindergarten procedures which have been found empirically useful in that setting. The psychologist in collaboration with other rehabilitation specialists has an exciting future in the design of methods for studying the learning processes, development of techniques of measurement, and exploration of new techniques of teaching.

The contribution of the psychologist in the role of therapist, the situation in which he directly helps the patient, has roots in half a century of psychological progress but only recently has it become a major effort of many psychologists. Here the psychologist becomes a working member of the therapeutic team. He makes his contribution in his own right but he makes it as one member of a group with a common objective. We know that in the case of a handicapped person, an amputee for example, that person's view of himself, his perception, his concept, his evaluation of his own body, his estimate of other people's judgment, and his own complicated chain of reactions to this estimate, all may be violently distorted by the very fact of his injury and deprivation. We know, too, that this distortion need not be so devastating to his adjustment as it often is. The psychologist with therapeutic skill is often in the best position among those engaged in rehabilitation to help the patient reach truer, more satisfying, and more realistic evaluations of himself and his situation.

The psychologist, then, should be thought of as playing two roles in rehabilitation. First, he is a contributor to the field of rehabilitation knowledge and a disseminator of scientific psychological knowledge to his colleagues. Second, he directly helps the patient on his way toward recovery.

**DR. PIASKOSKI:** Thank you, Dr. Holsopple. The problems of illness and disability cannot be separated from social and economic problems. Miss Margaret Towne, Program Director and Medical Social Consultant, Wisconsin Association for the Disabled, Madi-

son, Wisconsin, will speak on "Social Determinants in Rehabilitation." Miss Towne.

**MISS MARGARET TOWNE:** To those of us who like people and enjoy working with people, meetings like this are heartening. It is good to note the increased consideration to all aspects of a patient's difficulty. It is helpful too, to share the thinking of the different kinds of specialists, to learn how each of us can utilize the others' services in doing the job better. Although each member of this panel represents a different profession, it is important to recognize the objective toward which we are all working is the same, that of assisting the patient toward the maximum degree of physical and emotional restoration, and helping him return as a useful and happy member of society in the earliest possible time.

The social determinants in rehabilitation are no different than those determinants which affect any of us in our daily lives except perhaps their meaning is sharpened against the impact of illness or disability. The influences, recognized or hidden, flagrant or insidious which strengthen or weaken us in our ability to carry out the routine responsibilities of each day, to achieve special plans or important objectives, or to meet difficult challenges or emergencies, are the same influences which color so importantly the feelings, the drives, the accomplishments of those whom we are attempting to help.

If certain influences, social or emotional, are common to all of us, is it important or even necessary to have an awareness of the meaning these influences may have on the patient, if our efforts to help him meet his total needs are to be realistic and fruitful? With what kind of person are we concerned? What has been his background? What do we know about his family? What is the patient's position in the family, and what is the meaning, the true importance of this position to him? What is his cultural heritage, his religion, his race? What is his educational background, what are his interests, ambitions? What is his learning potential? How does he feel about himself and others? What is the environment in which the patient has functioned? What have been the stresses and strains? How has he handled his life before he came to our attention? How do these many factors affect him in his illness or treatment plan?

The real meaning of any understanding we may have of a patient comes only when such understanding is applied to the question, what is the problem this patient needs to handle? What is his physical disability, and what are the treatment plans? What are the patient's feelings about the situation, and what can be done to help him achieve the goals which appear possible for him? Tying together the implications of crippling, illness, or trauma, the arduous challenge of rehabilitation procedures, and the hu-

maneness — both strengths and weaknesses of every patient—is what makes the job of rehabilitation a wondrous challenge to anyone who has a part in it. Fortunately progress is being made in integrating the various services necessary for a well-rounded treatment and rehabilitation plan within treatment centers. Much remains to be done, however, in coordinating necessary rehabilitation services for patients receiving attention on an out-patient basis.

Although we commonly think of the social factors in rehabilitation as those pertaining to, or being a part of the patient himself, we might well scrutinize those in other areas, those affecting the physicians, therapists and other workers concerned with rehabilitation, and the social determinants in the community in which the patient makes his home.

The pressure of living and working in the world today, our own needs to succeed, the drives to try to accomplish more than seems prudent or possible, suggest perhaps, a need to be aware of the stresses and strains of those providing the service, as well as those receiving it. A simple device, and an effective one for many of us, is to review thoughtfully our own definition of a service. Is it a thoughtful consideration of the questions or problem presented to us, making sure that some degree of help or satisfaction is provided the patient or person requesting help? Or does our service amount to a hurried assumption of what is being requested with a hasty referral to another department or agency, where hopefully the help can be provided? Yes, I believe we would all agree that there are factors affecting the behavior, the attitudes of those of us charged with helping, as well as those needing help. For after all, are we not humans, probably very tired and troubled men and women, dealing with men and women who rely on us for something?

We are all familiar, I am sure, with the importance of the community in which the patient lives in the success of any rehabilitation plan. Only a few of the important influences of a community can be mentioned at this time. Public education must continue, must be stepped up if attitudes toward the handicapped are to reflect intelligent understanding and helpfulness. Studies show employment of the handicapped, particularly certain diagnostic groups, is lagging. Provisions for education of the severely physically handicapped remain inadequate in many states. The lack of integration and coordination among many agencies and organizations established to help the handicapped leads often to confusion and disillusionment of those seeking and needing help. Might community as well as an individual ask, "Can we truly believe we are being effective in rehabilitation unless there is continuity and coordination in our plan?"

In our attempts to meet the total needs of a pa-

tient, it is important to recognize the social and emotional factors, the stresses and strains of daily living, the inner strengths and weaknesses of the patients in whom we are interested. Knowing the patient as an individual will better enable us to understand the meaning of his illness or disability to him, and will make more possible the patient-worker relationship so imperative to a successful rehabilitation plan. Those concerned with rehabilitation have a responsibility to understand themselves as well as the patients, — and probably most of all to interpret to the public the responsibility of the community to continue the work for the handicapped—begun by the rehabilitation team.

**DR. PIASKOSKI:** Thank you, Miss Towne. Since this is a Corrective Therapy meeting, it is only proper that we should spend just a little time on Corrective Therapy itself. So I shall call on Mr. Leon Edman, Field Supervisor, Area Medical Rehabilitation, Area Medical Office, Ft. Snelling, St. Paul, Minnesota, who will talk on "Corrective Therapy — A Doing and Feeling Process." Mr. Edman.

**MR. LEON E. EDMAN:** On a recent field trip the physiatrist at a hospital made the remark to me that his Corrective Therapists constantly were a source of amazement to him. The reason for this statement was that he consistently turned over to the corrective therapists, patients who had little further hope of definitive improvement and yet these men were happy to work with them day after day although improvement was slow and many seemingly reached a plateau after which progress stopped. Yet, after painstaking and patient work, even they developed to a higher level of activity and the therapists would just not give up. Even after everyone realized that the patient was at his highest potential and no possible improvement could be foreseen, these men would continue to work with him, satisfied in maintaining gains previously made and in preventing the rapid deterioration which follows inactivity—in short, to continue a maintenance rehabilitation program.

I thought this a very interesting remark and I think in attempting to discuss the reason for this attitude on the part of our Corrective Therapists we may bring out why we feel Corrective Therapy is a doing and feeling process. This attitude of willingness to work toward the elicitation of activity from any type of patient, is not confined to the end-of-the-rehabilitation-road patient alone, but is observable at whatever the stage of rehabilitation the patient may be prescribed to Corrective Therapy. Patients with certain psychiatric conditions, for example, are often sent first, to the Corrective Therapy Section of the Physical Medicine Rehabilitation Service.

Fundamentally, I believe, this attitude stems from



the Corrective Therapist's Physical Education background and its philosophy that physical activity is necessary for development and also that physical education consists not only of education of the physical but education *through* the physical — a philosophy with very wide implications, for Physical Education and by natural extension for Corrective Therapy. If, speaking for the Corrective Therapist's Physical Education heritage, they are to accept this philosophy they are also committed to a philosophy that it is not only desirable but also the right of an individual to participate in physical education activities as part of his total development and functioning. One of the principal aims of the Corrective Physical Education program in schools is that all children, regardless of the type of their defect, should not only be able but should be permitted to take some part in Physical Education. The program aims at detection of those children with physical and mental deviations, and with medical advice, placing them in a program from which they may profit. It aims ultimately at development of these individuals for a full life within the limits of their physical capacities. It does not take much imagination to visualize an extension of that philosophy and see a Corrective Therapist at work in one of our hospitals.

I believe that whether for teaching self-care, developing strength, reconditioning, for resocialization or whatever purpose prescribed, the Corrective Therapist is viewing his work fundamentally as the teaching of physical skills and viewing, as abstractly as possible, the patient as a total individual in a total setting who has a particular problem to overcome. This is fundamentally the, "treating the whole man concept", limited to just the Corrective Therapists contribution. This attitude or outlook is essentially the same for teaching and developing a paraplegic to the point where he can take his own shower as training and developing a 5 foot, 4 inch high jumper to accomplish 5 foot 6. I repeat the *philosophy, outlook and attitude* are essentially the same, the *application* is vastly different and I would like to forego further discussion on this until we reach the feeling part of this discussion on Corrective Therapy, a doing and a feeling process.

This philosophy I believe, explains why the Corrective Therapist will work so arduously and continually with patients with relatively poor prognosis for rehabilitation and also points up the unique contribution a person trained to this point of view has to make toward the total team rehabilitation effort. The need for activity is so ingrained in their teaching and training that they cannot stand by while a person obviously in need of physical activity is not getting it. Some of them have been known to even apply this *concept of activity for all to their own personal lives* and are observed to be quite active in var-

ious ways

An individual with an extroverted philosophy and outlook can exert a very wholesome influence and bring a stimulating atmosphere into the treatment clinic. At some time during the course of treatment of a patient with a rehabilitation problem the Corrective Therapist will most generally fit into the picture. This may be early or late or at some intermediary stage. Generally when the doctor is thinking of the patient at the stage when all the parts are to be fitted into a total activity pattern, speaking in a loose physical education sense of activity, the Corrective Therapist can best be utilized. This time is for the doctor to decide and the activity for him to prescribe. It is for the Corrective Therapist to carry out and in so doing he will utilize all the motivational devices and laws of learning incorporated into his knowledge as a student of Physical Education. The same principles are applicable *except* (and I think this is extremely important) for the limitations the particular disease or injury imposes and the fact that the Corrective Therapist is working in a medical setting whose objectives in treatment for the patient may be far different than those conceived by a physical educationist. Here, we are, I think, verging on the fundamental difference between a physical educationist and a Corrective Therapist. It seems to me quite apparent that although what we are doing with Corrective Therapy is adapting physical education procedures and what might be called a "physical education personality," if there is such a thing, or at least a physical education way of thinking to medicine to accomplish therapy. It is not nearly enough to be a physical educationist alone to accomplish Corrective Therapy. A Corrective Therapist must be primarily a *therapist* and into this aspect of his makeup, I believe, largely enters the "*feeling*" part of the "*doing and feeling process*."

Speaking generally, Physical Education is the vehicle for the doing — translating it into therapy requires a *feeling* for the patient and for rehabilitation which only medical direction, practice and knowledge can supply.

Now what transmutes a physical educationist dealing with those sound of limb and mind and generally completely extroverted into a therapist whose interest is in persons sick in limb and sick in mind, a person who must, though outwardly extroverted, be at least introverted enough to try and understand himself so he can best understand and help those entrusted to his care? This question has been asked before. Dr. Greenwood developed a questionnaire the purpose of which, I believe, was to discover if there was in the background of all Corrective Therapists some *common factor* which would explain why they became therapists instead of remaining teachers and

coaches. In 1950 an effort was made to develop a test which would select Corrective Therapists. I don't know if anyone has come up with an answer as to what makes a Corrective Therapist "tick," or any therapist for that matter. I am quite positive that I do not know. I feel quite certain that the Corrective Therapists as for all therapists, the answer must lie somewhere in the personality components of the individual. I feel quite strongly, speaking for Corrective Therapy alone, that the type of individual who is attracted to the *ideals* of teaching and who is interested primarily in physical education, distinguishing physical education from high powered athletics, has a good potential for making a Corrective Therapist. This is not to say that a good athlete is not a good potential for Corrective Therapy but he must be the type who has his interest in the development of a good all around physical education program *for all the pupils in a school* rather than the development of athletic teams. Such a person has the essential sensitivity to develop the feeling for the work that a therapist must have. So far we have discussed, very sketchily, what kind of a person can be developed to have the feeling which is the necessary ingredient in the make-up of a therapist. What is this feeling?

The application of the coaching skills as a part of physical education calls for a feeling for the work on the part of the coach. He must know who on the team he can push and where he must tread lightly. He must know when a player is ready and when it is better to rest. The Corrective Therapist must know all these things with his charges in a much more complicated medical setting. He must know the medical significance, the physiological and psychological repercussions of his activities, the rehabilitation goals, the individual precautions to be observed and the personality of the patients on an individual basis. He must be alert to changes and be able to record them in an objective and medical fashion. These and other aspects of his work require an *ability to feel*, to sense what is right to do and avoid what is wrong for each patient. The Corrective Therapist is in a sense an extension of the eyes and ears of the doctor. He must develop the same type of feeling which the physician has toward the patient. He must, while being objective, still establish an interpersonal relationship with patients upon which confidence and faith in ultimate success will be instilled. He must, like all therapists, and this is hardest to accept, be the first to see and first to admit when he is wrong for a particular patient and report on this in a completely objective way to his team leader, the physiatrist. Above all he must be of the type who takes his reward largely in only the inner knowledge that he has contributed somewhat to the patient's ultimate rehabilitation.

DR. PIASKOSKI: Thank you, Mr. Edman, I would like to summarize very briefly by saying that I believe each speaker has presented very clearly the role of his particular field in total rehabilitation, and such role is of equal importance. But they have all emphasized the greater importance of harmonious interaction, which I believe is best designed by the term teamwork because teamwork is the cooperative effort of many individuals, each subordinating personal prominence for the good of the whole, which is the secret of success in any rehabilitation program. The time allotted for this panel is up. However, I think we can take a few minutes for questions from the floor, if there are any.

#### DISCUSSION PERIOD

QUESTION: What is Dr. Steinberg's objection to the term team or teamwork?

DR. STEINBERG: I probably have an emotional block, seeing that is the topic of my paper, and I would be happy to answer questions on emotion. However, team, having been oriented a little in athletics myself, connotes something I abhor in an approach to a patient. You train the team for opposition, for fighting, for something. That is the connotation of a team, and I hate to approach any patient with that idea myself. If you use the term teamwork, I will agree. Teamwork is a constructive thing. Fighting never has built anything as far as I know, and I am not a pacifist. Don't get me wrong. That is a brief statement. It is just that I don't like what it implies. I have worked with people who have mis-used the term and have traded on it to the detriment of everybody concerned with the patient. I could go on about this thing if you want to discuss it, but I don't think it is pertinent. You can have your teams and be happy with them. I will even help coach. There are many aspects of teamwork, teamplay, team approach that can be questioned. The term has a tendency to creep in and be used, not specifically, but as a complete term to include everything. I don't think we are going to make progress that way. We have too much of that now in psychiatry. We toss around egos. We toss around emotions. We toss around identifications with many people not knowing specifically what they are saying. Today I think everybody here emphasized the approach to the patient, knowing the patient, and that is my orientation.

DR. PIASKOSKI: I think Dr. Steinberg has made some good points which deserve additional thought. Perhaps there is a better term than team or teamwork which we may adopt in time. But until then I think the term teamwork is the only good one we have. Are there any other questions? If not, I would like to thank the members of the panel and all of you for the privilege of appearing before you. Thank you.



# THE HACK SELF-RELIANT WALKER: AN IMPROVED AND TESTED AID IN AMBULATION \*

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Frequent efforts are made to improve standard equipment in the various fields of rehabilitation. This paper discusses one of the more successful attempts to modify and improve the standard walker. We will cover the history, selection of patients, method of development, excerpts of a report dealing with improvement factors, and special adaptation of the equipment.

The Hack Self-Reliant Walker was developed at the Veterans Administration Hospital, Van Nuys, California, with the sanction of the Department of Medicine and Surgery of the Veterans Administration, Washington, D. C. Under the direction of the Physical Medicine and Rehabilitation Service, the Corrective Therapy Department at the Van Nuys hospital was given the opportunity of assisting the inventor with this project. The follow-up on the project was accomplished at the Veterans Administration Hospital, Long Beach, California.

The method used in selecting patients for treatment was determined by consultation with a prescription from the doctors of the various medical services coordinated and supervised by the Physical Medicine and Rehabilitation Service. Patients with extreme disability of physical or mental nature were prescribed for treatment. Patients who were already under treatment and who were having unusual difficulty in the use of standard equipment for physical or psychological reasons were also tested. The variety of patient types tested gave vent to additional ideas and changes. Patients of unusual size, weight and height were selected to allow therapists to determine usefulness of the walker. This overall type selection assisted in determining the accessibility of the walker and how much therapist assistance would be necessary at the time of application.

A miniature wire model of the walker was constructed so that changes could be recorded progressively as they were suggested by the staff. This enabled the inventor to record temporarily the features that would later be incorporated in the end product.

\*Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

\*\*The authors wish to express their appreciation to Dr. Richard V. Freeman, Chief, PMRS, and Mr. Ben Reinhardt, Executive Assistant, for valuable suggestions.

The miniature model became very valuable for illustration purposes where it would be difficult to take the full-scale walker.

Excerpts from the final written report on the findings of this research will appear in the following paragraphs of this paper. Pictorial illustrations and facts are projected here in a sincere effort to demonstrate the practical features of this walker.

## *Special Characteristics of the Walker:*

- a. Indented frame — This feature is a decided asset when placing the patient in or taking the patient from the walker. The walker overlaps the bed in such a way that the actual strain of lifting the patient to the standing position is definitely minimized. (See illustration No. 1)
- b. Detachable ladder frame — This type frame allows for variation in stature as well as rendering various levels of support for ambulation. It also simplifies application and instruction. (See illustrations Nos. 1 and 2)

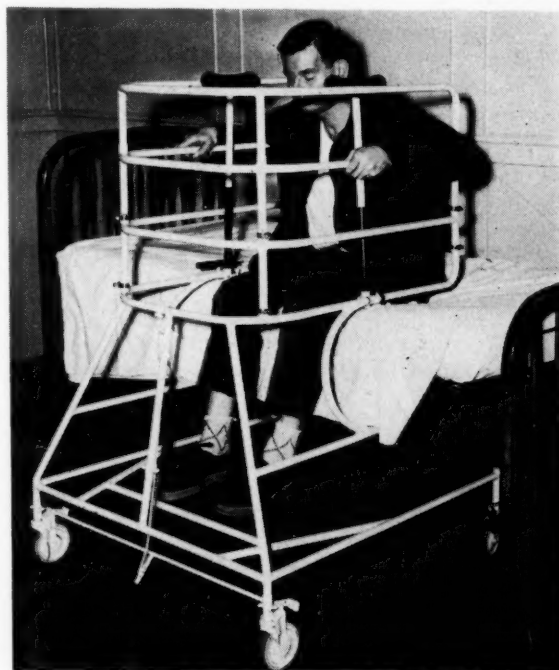
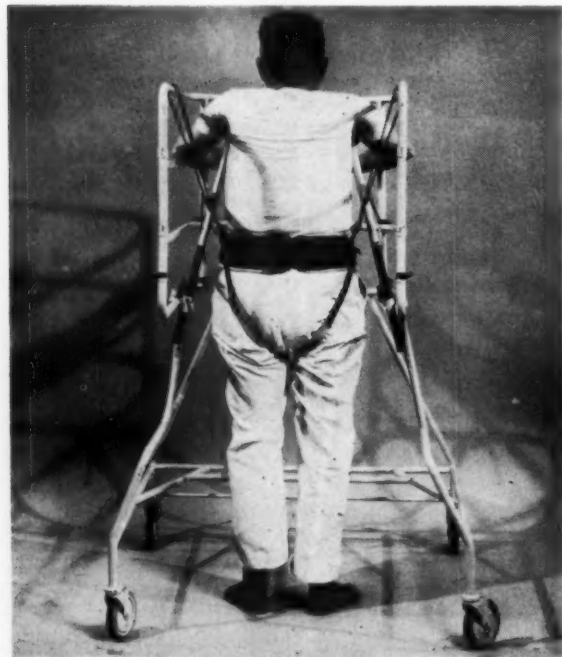


Illustration No. 1

Demonstrates how the indented frame fits to the bed, and illustrates detachable ladder frame, wheel lock, general frame size, individual frame set-screw locks.

- c. Wheel lock — Very effective at time of placing or removing the patient from the apparatus in that it acts as a stabilizer. The walker can be stopped in its forward progress in an instant, if necessary. This is a very important item in the initial steps of walking to avoid uncontrolled movements of the walker. (See illustration No. 1)
- d. General frame size — Although larger than other type walkers, the size of frame with its broader base has a marked psychological effect on the patient, giving a strong sense of security. The broad base allows more room for abnormal gaits with unusual abduction. The size has not in any way interfered with the maneuverability of the walker, since it glides easily in any direction. (See illustrations No. 1 and 2)
- e. Individual set-screw locks have been added to each frame to prevent the sections from parting. This is a very important safety factor. (See illustrations Nos. 1 and 2)
- f. The safety belt, a leather type with simple attachments, now enables the patient to get in and out of the apparatus in half the time and with half the effort. The belt is put on while patient is in sitting or lying position and it is snapped onto the frame in two easy movements. (See illustration No. 2)



**Illustration No. 2**

Demonstrates patient using walker with safety belt attached. Note detachable ladder frame, and individual set-screw locks construction features. Note room allowed at base for abduction of either lower extremity for patients with abnormal gaits.

- g. A web seat that straps back of the patient which allows him to rest at will can be added. (Not shown)

#### *Patient Types Treated:*

The variety of type patients tested are listed as follows: Poliomyelitis, Hemiplegia, Spinal Fusion, Amputee (bilateral and unilateral), Dual Involvement-hemiplegia and amputee, Cauda Equina, Head Injury, Multiple Sclerosis, Arthritis, Amyotrophic Lateral Sclerosis, Parkinson's Disease, and Hysteria.

The Hack Self-Reliant Walker has proven to be an improvement over standard type equipment that is available. It is easy to place the patient in the walker and just as simple to remove him from the apparatus. Through the design of the walker and the safety belt attached, there is a factor that gives the patient a feeling of well-being. It is easily maneuvered by the patient allowing for more relaxation and giving way to better direction of energy.

With the present demand on therapist time, it is possible to place a patient in the walker and let him propel himself in complete safety, while the therapist is free to attend to other immediate problems. It is impossible for the patient to fall and injure himself.



**Illustration No. 3**

Special adaptation to the stationary bicycle. Note supporting features.

#### *Special Adaptations of the Walker:*

An additional application of the Walker for treatment is demonstrated by illustration No. 3. The particular case shown is a poliomyelitis patient with residuals in upper and lower extremities and trunk. With the trunk stabilizers severely impaired it was impossible to utilize the stationary bicycle without some support for the trunk. Up to the time that the

Hack Walker was put into use, leg exercises in the sitting position were accomplished with the patient being given support by a therapist.

The apparatus has adaptable features that make it ideal for application. The spacious area inside the walker made it easy to place it around the bicycle. The locks on the wheels set the walker firmly adding an important safety factor. Once again the therapist is free to treat other cases leaving the patient with a definite feeling of security in his activity.

This article was written on observations of the Corrective Therapy staff at this hospital and is published with the idea that other patients in other hospitals may have the benefit of using this piece of equipment that has served the patients so well in the Veterans Administration Hospital at Van Nuys, California and the Veterans Administration Hospital at Long Beach, California.

*Footnote:*

1. Mr. Nathan Hack is probably better known for

his Convalescent Boot that he developed and presented to the Armed Forces during World War II. He is presently engaged at the University of Southern California as Research Associate in the Laboratory of Performance Physiology in cooperation with Dr. Laurence E. Morehouse. For his untiring efforts in behalf of disabled persons, the authors wish to express heartfelt thanks to Mr. Nathan Hack.

2. Research on the Hack Self-Reliant Walker was accomplished under the direction of John H. Aldes, M.D., at Van Nuys, California. At the present time the walker is in use under the guidance of Roy H. Nyquist, M.D., at Long Beach, California.

3. Gratitude is expressed for the technical assistance given by Morse P. Manson, Ph.D., Chief, Vocational Counseling Service, and Thomas Masterson, Photographer, Medical Illustrations Department, Veterans Administration Hospital, Long Beach, California.

## SOME PSYCHOLOGICAL ASPECTS OF THERAPEUTIC ACTIVITY IN A NEUROPSYCHIATRIC HOSPITAL\*

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It is becoming almost axiomatic that the psychological aspects of the role of a Corrective Therapist are at least as important as are the physiological ones. Thus, in speaking of therapy for neuropsychiatric patients, Knudson and Davis have written: "Exercises are considered to have a distinctive effectiveness in meeting the emotional needs of the patient. The value, however, depends on the ability of the therapist to modify these exercises and to produce activity situations which will attract the patient into improved social adjustment. The major interest is not in the development of exercise per se, but in its integration into a total situation in which the patient is willing to accept a higher level of socialization. In this motivated environment the therapist is able to create the most effective interpersonal relationships . . . The corrective therapist should develop a favorable therapeutic rapport with the patient, thus establishing a usable transference, which will permit progression to a higher activity."<sup>1</sup>

Under these conditions it would be strange indeed if every experienced therapist did not develop certain psychological principles of whose truth he is

empirically convinced. It is the purpose of this paper to discuss some of these principles which seem valid to the authors. No claim is made that they are valid in actuality. Rather it is hoped that putting them into print will lead to a discussion which will cast additional light upon their justification.

Therapists are continually told that they must motivate a patient to do something. We do not believe that it is possible for one person to motivate another to do anything. The therapist at best can only hope to stimulate the patient to motivate himself. The dictionary definition of motive is, "That within the individual, rather than without, which incites him to action."<sup>2</sup> Glass, in speaking of psychiatry at the Army division level, emphasizes, "Stress should be placed on the 'gain in illness' syndrome, which often occurs with evacuation and the subsequent fixation of symptoms that may render the soldier neurotically disabled."<sup>3</sup> By the time mental patients reach a Veterans Administration hospital their symptoms have been definitely fixed, and usually the 'gain in illness' is evident.

Most of the patients seen by the writers have never had overseas duty of any kind. By becoming ill while in a recruit status they were able to avoid this potentially dangerous situation. Shortly before the start of the Korean War there was something of a business

\*Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion of the Veterans Administration.

recession. At that time returning patients told the writers quite honestly that, "Things were tough on the outside and I couldn't find a job, so I came back and turned myself in." Time after time patients presented to therapeutic boards will state frankly that they do not wish to be transferred to a building "which will permit progression to a higher activity," or that they do not wish to be discharged.

One of our patients has been on the medical ward for about two years. He has no physical condition which requires medical treatment, but every time the physician tells him that he is to be transferred to a chronic ward, the patient immediately becomes sick. As soon as he sees that his illness has obviated the threat of removal to another ward, he begins to recover. He has been rehabilitable only to a certain point. As soon as the point is reached where his *status quo* is threatened, he refuses further treatment.

Underlying these actions seems generally to be a fear pattern. The patients appear to dread going to other buildings or leaving the sheltered hospital environment because they fear that their personal inadequacies will make it impossible for them to make a satisfactory adjustment to the demands of the new situation. It is not a question of motivating them; they are already powerfully motivated, even though negatively so by the standards of the society in which they live.

It is our belief that the role of the therapist is to assist the patient by helping to create an environment in which the patient will come to realize that his anxieties are far greater than the realities of the situation justify, so that the patient himself may gradually change his own motivations. Normally this is a fairly long drawn out process. It may, for instance, involve strengthening the patient's body so that he does not fear his own physical weakness will prevent him from performing successfully in a given situation. It may involve teaching the patient new skills, so that he does not fear that his own technical inadequacies will prevent him from performing successfully in a given situation. It may involve helping him to increase his own self-esteem to the point that he can effectively employ the physical and technical abilities which he already possesses. It may involve giving the patient an opportunity to express his hostility acceptably, so that he can do so without fear of retaliation from society.

We believe that the most important technique in accomplishing these and other similar treatment aims lies in the establishing of satisfactory interpersonal relationships between the therapist and his patients. Probably no one procedure is so important as is the matter of giving the patient security — the feeling of being accepted as a member of society. The activity is of secondary importance, but, like all medical pre-

scriptions, must be carried out if the rehabilitation program is to be successful. Compliance with a prescription is mandatory and not optional if the desired end is to be achieved.

Improving posture, for instance, is seldom a matter of simply developing any great increase in the strength of certain muscle groups. Rather, it centers around helping the patient develop a new attitude toward his environment, so that he literally stands up and faces it, instead of cowering before anticipated — and often wholly imaginary — blows from it. Treatment directed only toward a given disablement often does little but focus the patient's attention still more upon the disablement, so that, "that man's last state is worse than his first."

The technique of achieving the desired goal varies in each individual case. Many of these patients refuse to speak, and the success of the therapist in instituting the proper treatment depends largely upon his ability to interpret the patient's actions.

One of our patients was an extremely regressed catatonic. The therapists tried to give him a feeling of acceptance and friendliness. Gradually the patient began to respond. On one occasion his behavior was such that it was not advisable to take him off the ward. The patient wrote a note expressing his feelings and gave it to an Occupational Therapist for delivery. He began to display jealousy when attention was given to other patients. Shortly afterwards he began to walk. Within a comparatively short time he was discharged from the hospital and entered college. After leaving the hospital, the patient wrote a letter telling the therapists how much he appreciated what they had done for him.

Admittedly the employment of this interpersonal relationship to achieve rehabilitation is often very difficult. Certainly it is an insult to the patient's intelligence to pretend that a disablement does not exist. He must be brought to recognize the realities of the situation, accept them, and overcome them. To help him to do all this sometimes approaches a fine art.

One of our patients has had seven ribs removed and a lung collapsed. He is very sensitive about his appearance. Exercise can improve his physique and strength by building up the muscles of the thorax, but it would be folly to pretend that there is anything which would again make his appearance completely normal. The patient must accept the fact that he will always differ from the norm anatomically and that he can never again participate in sports involving physical contact, such as boxing or wrestling.

He states that he formerly liked to swim, but that the water pressure now makes him uncomfortable and that his appearance makes him dislike to appear in public. He is being encouraged to learn



to swim backstroke while in the hospital in hope that this will relieve the physical discomfort and permit him to again enjoy his favorite sport. At the same time he is assured that the therapist fully understands how he feels about his appearance; that this is an entirely normal reaction; that it is a condition with which he must live the rest of his life and that he should simply accept it as such; that in any case there are still sports like fencing and badminton in which he can engage successfully and fully clad. As soon as his degree of rehabilitation permits he will be taught the basic skills necessary for successful participation in an activity of this kind.

It has been our experience that patients are best handled in small groups, with each member of the group being given individual attention. No individual can be with just the therapist, and attempts to work in such a manner very frequently lead to an undesirable transfer of emotion to the therapist. A therapist can handle only so much of this. In a group situation the transference is far less and the therapist may deal with it more safely. The patient must be directed toward the eventual goal of mingling with others, the great majority of whom are classified as "normal." Individual work will not carry over in the post-hospital environment. The group situation and group acceptance in the hospital are a necessary preliminary step before the patient will feel able to brave the dangers of the group situation outside the hospital.

With a certain percentage of patients, the emphasis must be on self-control rather than on stimulation. These individuals over-compensate so greatly that they exhaust their rather limited resources if they are not encouraged to husband them. This has been reported to be particularly characteristic of cerebral palsy patients.

Activities such as weight training are especially useful for establishing interpersonal relationships. The patient exercises for a few minutes and then takes a short rest before going on to the next exercise. While he is resting the other patients are working, thus creating excellent conditions for personal attention in a group situation. Most patients have had more or less experience in sitting around "shooting the bull" in physical education or sports activities and the informal, non-critical atmosphere which they have learned to associate with such activities makes it easy for them to talk freely in a Corrective Therapy gymnasium, especially as they frequently tend to identify the therapist with the father image of the coach.

It will be found that when a patient once starts to talk, he is apt to be full of the wrongs done to him by an unjust world. His early conversation will often be little more than an extended series of complaints. Listening to this sympathetically and non-judicially

is often difficult, but it is probably the most valuable thing the Corrective Therapist does in a mental hospital. The physical activity may serve as a key to unlock the patient's repressions. The activity may afford the opportunity to express his emotions through physical means or to verbalize the anxieties and hostilities that have been dammed up within him and which he has found impossible to express to those whom he fears might condemn him for having such thoughts. The Corrective Therapist at this point encourages expression and ventilation by his non-judgmental attitude.

How should this material be utilized? It is our belief that the Corrective Therapist should make no attempt to provide counseling and guidance on any except a superficial level. Rather, these conversations should be reported to the psychiatrist or psychologist working with the patient in order to assist him in his work. Psychotherapy is often a painful and even threatening experience for a patient. Anything approaching it should be left to those who are expert in its use.

This is not to say that the therapist should not be familiar with the techniques of non-directive guidance. Academic training in this field will certainly assist him in handling his patients. At Brentwood Hospital the opportunity has been afforded therapists to take psychotherapy themselves on a purely voluntary basis. It is evident to those who have participated in these sessions that considerable beneficial results have been achieved in the lessening of tensions between individuals and in the development of more mature attitudes. A therapist who has had this experience will be himself better adjusted and hence better able to understand and work with his patients.

The *sine qua non* of good therapy is the constant recollection that the important person in the therapeutic situation is the patient. The methods and techniques of physical education have proven to be valuable tools in the rehabilitation of the mentally afflicted patient. It is our responsibility to further develop and refine these tools so that we may play an even more effective role in the overall program of the psychiatric hospital. If this paper contributes in any way to that increase in effectiveness, the aim of the authors will have been achieved.

1 A. B. C. Knudson and J. E. Davis, "Medically Prescribed Exercises for Neuropsychiatric Patients," *The Journal of the American Medical Association*, 140:1091, July 30, 1949.

2 *Webster's Collegiate Dictionary*, Fifth Edition, Springfield: G. & C. Merriam Co., 1948, p. 651.

3 Albert J. Glass, "Psychiatry at the Division Level," *The Bulletin of the U. S. Army Medical Department*, Vol. IX, Supplemental Number, November, 1949, p. 47.

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## "From Other Journals"

KHALIL G. WAKIM, M.D., Ph.D., "The Physiological Aspects of Therapeutic Physical Exercise." *The Journal of the American Medical Association* 142:2: 100-108 Jan. 14, 1950.

*Editor's Note: The Association Editorial Staff is grateful to the Editor of the Journal of the American Medical Association and Khalil G. Wakim, M.D., for permission to reprint this comprehensive paper in its entirety.*

A casual observation of a normal person in the midst of a feat of physical exercise impresses on one the important fact that all the systems of the body act in a nicely integrated manner toward an efficient achievement of unified action. During mobilization of the human body for physical activity, coordination of functions is of paramount importance.

The optimal effects of physical exercise are attained when oxygen is efficiently, sufficiently and continuously provided through the respiratory system, fuel is generously made available for the various tissues, especially the muscles, impulses through the central nervous system are sent to the skeletal musculature in a coordinated and integrated manner, and the waste products are completely eliminated without overtaxing the excretory organs or causing any disturbance in the acid-base, electrolyte and water equilibria in the organism.

### SALIENT ANATOMIC FEATURES OF SKELETAL MUSCLE

Since skeletal muscle give the most vivid evidence of the physiologic effects of physical training, a discussion of their salient anatomic features is quite appropriate before the physiology of physical exercise is detailed.

The skeletal muscles make up about 50 per cent of the body weight of man. Each muscle is composed of many thousands of muscle fibers lying practically parallel one to the other. The individual fibers are bound together and are enclosed by a delicate connective-tissue sheath. About a dozen or more muscle fibers are grouped together in the form of a bundle (fasciculus). The whole muscle, composed of many fasciculi, is ensheathed by a fascia made of fibrous connective tissue. This strong framework of connective tissue becomes attached to the periosteum either directly or by forming a tendon at each end of the muscle through which it is attached to the periosteum of the bone.

The individual muscle fibers are cylindrical or prismatic in form with tapering ends. Each muscle fiber is composed of a fluid portion, the sarcoplasm (muscle cytoplasm) and a large number of myofibrillae or sarcomeres, which are the contractile elements.<sup>1,2</sup> The wall of the muscle fiber is made of a homogeneous elastic sarcolemma, inside which several nuclei are scattered. Microscopic examination of fresh skeletal muscle fibers reveals the presence of both longitudinal and transverse striations. The transverse striations are produced by the alternate light and dark bands present in the muscle fibers and lying across the fiber in the same level in adjacent fibrils.

### TYPES OF SKELETAL MUSCLES

On the basis of color, skeletal muscles are divided into two types, red and white (pale). The relative amount of sarcoplasm in the fibers varies. The color of muscle depends on the amount of pigment present. The red muscle contains enormous amounts of pigment granules (muscle hemoglobin), which give it the reddish appearance. Red muscles are capable of slow, powerful and long-continued contractions. The diaphragm and extensor muscles (postural) are good examples of predominantly red muscles. Such muscles that are engaged in powerful, slow and repeated movements are not easily fatigued and may contain more than one per cent of muscle hemoglobin, which is endowed with the property of combining more readily with oxygen than blood hemoglobin. Muscle hemoglobin furnishes an excellent local store for oxygen. Red muscles are more granular, less distinctly cross striated and less irritable, but give a stronger and more maintained contraction than pale fibers. White (pale) fibers are specialized for speed rather than strength of contraction. The rapidly acting muscles, such as breast muscles of birds and also flexor muscles in general, contain high concentrations of cytochrome oxidase sys-

tems, which are primarily concerned with the activation of molecular oxygen and its utilization in oxidative processes. Flabby muscles are believed to become pale as a result of rapid loss of myoglobin consequent to paralysis.<sup>3</sup> The muscles of man are made up mostly of the two types of fibers, namely, red and white; the relative predominance of one or the other varies according to the function of the muscle.

### NERVE SUPPLY OF SKELETAL MUSCLE

The individual muscle fibers are so insulated from each other by the sarcolemmal sheath that stimulation of one fiber does not directly affect adjacent fibers. Consequently, in order to arouse a muscle fiber to action voluntarily, messages in the form of impulses must be sent to it along the motor nerve twig which penetrates its sarcolemma. Each muscle fiber is supplied by a separate branch from a motor nerve. As this nerve fiber penetrates the sarcolemma, it breaks up into several ramifications which terminate in a specialized mass of myoplasm known as the motor-end plate. When a single anterior horn cell in the spinal cord discharges impulses to a muscle, a certain group of muscle fibers, ranging between 100 and 200 in number, contract together as a unit. The axon of a motor nerve cell and all the 100 to 200 muscle fibers supplied by its ramifications form what is recognized as a motor unit. This is the basic functional neuromuscular unit which is believed to correspond to the fasciculus, in muscle.

It must be kept in mind that in addition to the motor nerve supply, skeletal muscles are also provided with sensory nerve endings embedded in the connective tissue framework between the muscle fibers and in association with the tendons. These are stimulated by changes in tension in the muscle. During contraction, relaxation or stretch of the muscles, sensory nerve impulses are carried to the higher centers, conveying information of the state of the muscle and of the position of the parts of the body with respect to one another. The maintenance of muscle tone is dependent on such impulses.

There is no positive evidence for the existence of direct sympathetic nerve supply to skeletal muscle, as claimed by some; however, the consensus is that the sympathetic fibers present in muscle are vasomotor to the blood vessels. The existence of trophic fibers has yet to be proved. It is still in the battleground of speculation.

### BLOOD SUPPLY OF SKELETAL MUSCLE

Muscle is richly supplied with blood. Each muscle receives blood through one or more arteries which branch freely and provide an extensive capillary network in the connective-tissue framework, supporting the individual muscle fibers. The sarcoplasm of the muscle fiber is separated from the blood in the lumen of the capillary by only the thin sarcolemmal sheath and the capillary endothelial wall. This provides means for efficient exchange of nutritive materials and wastes between the blood and the muscle. Capillaries are so abundant that an estimate of 4,000 per cubic millimeter of muscle cross section is given.

The distribution of the venous channels in muscle follows that of the arterial. Veins, however, are richly equipped with valves, including their minutest branches. This provides a uni-directional flow of venous blood (toward the heart) by compression of the veins during muscular contraction. This is the basis for the implication of the "milking" action of muscles in reference to the venous circulation.

Krogh<sup>4</sup> reported a great increase in the number of patent capillaries in activated muscles. Petren and co-workers<sup>5</sup> noted an increase of about 45 per cent in the number of capillaries in guinea pig muscles during exercise as compared with those that were not exercised. They suggested that the increase in bulk of muscle during training is due to the increase in the number of capillaries. During inactivity many of these capillaries are closed, but more and more of them become patent as muscular activity increases. In this way the blood supply to a muscle is adjusted in accordance with the degree of vigor of muscular activity so that it insures a better circulation and supply of oxygen and a more efficient disposal of wastes.

### THE ROLE OF THE NERVOUS SYSTEM IN MUSCULAR ACTIVITY

In a normal person muscular activity is brought about by impulses originating in the central nervous system. The principle underlying the development of motor skills is primarily perfection of the speed and accuracy with which the nervous system coordinates and correlates muscle action.

Postural contractions, including muscle tone, and phasic contractions, including reflex and volitional movements, are

the two fundamental types of neuromuscular activity.

**Muscle Tone**—Intact skeletal muscle with normal connections to the central nervous system displays a slight firmness in the form of sustained contraction usually recognized as muscle tone. Muscle tone is most evident and is easily demonstrated in the antigravity muscles; namely, those responsible for keeping the head erect and the jaw closed, and those which prevent the body from sagging at the joints, especially hip and knee.

Muscle tone is believed to be reflex in nature with the sensory side of the reflex arc residing in the proprioceptors located in the muscles (muscle spindles) and in the tendinous attachments of muscles to bones (tendon organs). These proprioceptors are stimulated by tension or pressure. Consequently, when a muscle is stretched, impulses are sent up the central nervous system, along the sensory nerve fibers whose endings are in the muscle spindles and tendon organs, and bring about a stimulation of the motor nerve cells whose efferent impulses are conveyed to the muscle fibers and induce contraction of that muscle. This stretch reflex is a fundamental factor in muscle tone and is usually well developed in the antigravity muscles (extensors). It is mainly responsible for the maintenance of body posture. Preservation of an upright posture is brought about by reflex contraction of the extensor muscles whose proprioceptors are stimulated by the stretch, and consequently prevent the knee joint from buckling.

Even though muscle tone is reflex in nature, the influence of the higher centers on posture and muscle tone is of paramount importance. An unconscious person, whether in sleep or fainting, has control neither over muscle tone nor over posture—his body crumples under its own weight. In a man deprived of his higher centers, the basic reflex mechanisms may be intact, yet he is unable to maintain normal posture.

In the maintenance of balance or equilibrium, the higher centers from the cerebral cortex, cerebellum and proprioceptors of the inner ear either increase or diminish muscle tone as the condition demands. Whenever the maintenance of equilibrium is threatened, reflexes from the retina, the labyrinth of the internal ear, and the muscle spindles of the muscles of the neck and extremities initiate corrective movements which restore normal posture and equilibrium.

**Phasic Contractions.**—Whether reflex or volitional, phasic contractions produce movement. Volitional contractions are involved in the development of motor skills. In the initial stages, before skill is attained, great attention is devoted to the component movements in a skilled act. These are controlled by the motor area. Visual and proprioceptive mechanisms aid in the necessary adjustments of strength and extent of movements. With practice the proper sequence of the various components of skilled movements are learned and attention is no longer required. Finally the act is performed entirely by proprioceptive guidance.

#### TYPES OF CONTRACTION OF MUSCLE

The response of a muscle to a single stimulus is known as simple contraction. The duration of the contraction varies considerably in different animal and in different muscles of the same animal. It varies from one second in the terrapin to 0.1 second in the frog, to 0.003 second in insects, to 0.07 second in the rabbit. This is in skeletal muscles.

**Isotonic Versus Isometric Contraction.**—If the muscle is allowed to contract and shorten while contracting, such a contraction is *isotonic*. A portion of the energy liberated is converted into work by lifting the load. If the muscle is allowed to contract against a resistance too great for it to overcome, it cannot shorten and, therefore, the length of the muscle remains the same and the contraction is spoken of as *isometric*. The portion of the energy corresponding to that in doing work in the isotonic contraction now is utilized in developing tension in the isometric contraction. Fenn<sup>6</sup> proposed a classification which provides a better framework for the study of muscle. He classified muscle contractions into three categories: (1) tension during shortening; this accelerates or raises load, gives positive work, and positive excess energy; (2) isometric tension; this provides fixation, no work, and no excess energy; and (3) tension during lengthening; this decelerates or lowers load, gives negative work and negative excess energy.

Several types of contraction relative to muscular function should be viewed. When contraction of muscle produces decrease of distance between its origin and insertion, the process is known as a "shortening contraction" or a "concentric contraction." This type of contraction overcomes gravity or resistance and produces motion. During this contraction, either both ends of the muscle will move toward each other or, if one attachment of the muscle is fixed, the other attachment

will be moved. This action then can have various effects, the origin of a muscle can be moved or, reversing the movements of the parts, its insertion can be moved.

Another type of contraction is known as "eccentric," or "lengthening," contraction. In this type of contraction outside forces cause the movement and the muscle regulates the speed at which the outside force may move the part. The muscular force constitutes a braking action. An example would be that of the flexed forearm being pulled down by the weight of the forearm and hand. The triceps does not act at all to produce extension, but the biceps brachii increases its length while, nevertheless, braking the speed of movement. This action is of considerable significance in coordination and in regulation of speed of a movement in which the part already in motion may exert considerable momentum.

If a muscle acts "to take up slack" but does not produce motion, the action is known as a "static contraction" and is primarily stabilizing in its effect. Other examples of such action are numerous in the co-ordinated muscular movement of the body; for instance, the stabilizing contraction of the gluteus muscles to prevent pelvic tilt in the process of taking a step, or contraction of the extensor muscles of the wrist in order to stabilize the hand when flexion of the fingers occurs.

Another muscular action which is of importance in relation to co-ordination is that known as "guiding action." During this action, muscle does not actually perform motion but controls the direction of motion.

#### CHEMICAL COMPOSITION OF MUSCLE

The proteins of muscle are myosin, globulin, myogen, actin and stroma-protein. Myosin is considered as the contractile substance of muscle.

Skeletal muscle contains 0.5 to 1 per cent glycogen. Glycogen is the chief carbohydrate of muscle and is its store of readily available foodstuff. It is in special relation to the contractile mechanism and to the enzyme systems that are thrown into action when the muscle contracts. Also phosphocreatine is present in amounts of 400 mg. per 100 Gm. Phosphocreatine is easily hydrolyzed to creatine and inorganic phosphate. This is strongly exothermic. The concentration of phosphocreatine is highest in cardiac muscle and least in smooth muscle. Adenosine triphosphate is another labile organic phosphate present in muscle. In the hydrolysis of phosphocreatine and adenosine triphosphate, a large amount of energy is set free, appearing as heat. These are regarded as the compounds in which chemical energy is stored. They are the energy reserves.

#### CHEMICAL CHANGES IN MUSCLE DURING CONTRACTION

Muscular contraction is associated with the metabolic breakdown of certain chemical compounds. In spite of voluminous literature on the chemistry of muscle contraction, no crystallization of any opinions or definite conclusions can be made as yet. However, the consensus of most recent evidence suggests the following simplified sequence of chemical events during muscular contraction and recovery: (1) The breakdown of adenosine triphosphate supplies energy to initiate the muscular contraction which is believed to be due among other things, to a physical alteration of the protein myosin.<sup>7,8,9</sup> (2) Breakdown of phosphocreatine supplies the energy required for the resynthesis of adenosine triphosphate. (3) The breakdown of glycogen to lactic acid provides the energy needed for the resynthesis of phosphocreatine. (4) Approximately a fifth of the liberated lactic acid, or the carbohydrate resulting therefrom, is oxidized to provide energy for the resynthesis of glycogen from the remainder of the lactic acid produced. Oxygen is essential for the last step.

#### ENERGY TRANSFORMATION IN MUSCLE

When muscles contract, energy is liberated. The liberation of energy occurs as a result of the chemical reactions which take place within the muscle fibers. Lactic acid production from glycogen is one of the fundamental chemical reactions which give energy for muscle contraction. Resting muscle contains very little lactic acid (about 0.02 per cent). With the muscle in nitrogen and at rest, lactic acid is slowly produced to a maximum of about 0.4 per cent at death of the muscle in rigor. The fatigued muscle, placed in oxygen, recovers its irritability, and lactic acid disappears. Muscles resting in oxygen retain their irritability for long periods, and no lactic acid accumulates. As stated above, lactic acid production is one of the fundamental chemical reactions that produce energy for muscle contractions. The reaction does not require oxygen. Muscular contraction is essentially an anaerobic process. Oxidative removal of lactic acid is necessary, since its accumulation in

muscle leads to loss of irritability.

Muscle can produce large amounts of energy for a limited time in the absence of oxygen. One source of this energy is the partial decomposition of glycogen to lactic acid. Muscle requires oxygen for maintenance of normal irritability, for oxidative energy production and for the restoration of its anaerobic energy-yielding systems.

The formation of lactic acid from glycogen is accompanied with a large change in free energy. The free energy produced during the transformation of a glucose unit to glycogen and again to carbon dioxide and water is supposed to be about twelve times the free energy of glycolysis alone.

During exercise relative oxygen insufficiency develops and blood lactic acid rises, indicating that muscles are deriving energy from glycolysis. Later in the steady state of adequate oxygen supply, the blood lactate may be unchanged or may fall. No lactic acid accumulates after the oxygen supply becomes adequate to meet the energy requirements. After exercise, oxygen consumption does not at once return to the resting level. There is oxidative recovery, associated with removal of lactate and the refilling of the energy stores. (resynthesis of phosphocreatine, formation of glycogen from glucose and lactate). The ability of muscle to accumulate oxygen debt is very useful.

Oxygen debt is the amount of oxygen used (over the resting amount) during recovery from exercise. This may be as high as 16 liters. The ability to go into oxygen debt is dependent, in part, on lactate production. Amounts as high as 204 mg. per 100 cc. (normal 10) have been recorded. A certain amount of oxygen debt may be incurred without the appearance of lactate in the blood. But when the oxygen debt reaches 3 or more liters, there is a direct relationship between the amount of lactate in the blood and the magnitude of oxygen debt.

The recovery period, therefore, is made up of two phases, an alactacid debt which is related to oxidation of usual food materials metabolized for the production of energy and the lactate debt related directly to oxidation of lactate.

During muscular exertion there are two phases: (1) initial rise and (2) "steady state." In the initial states the metabolism does not rise immediately to the final plateau because there is a slight lag in the circulatory and respiratory adjustment at the beginning of exercise.

The steady state is the condition in which the intake of oxygen meets the needs of the muscle. With severe exercise the intake of oxygen no longer keeps pace with the metabolic needs. Therefore, the first limiting factor is the maximal amount of oxygen a person can take per minute. This is conditioned by the efficiency of the respiratory and circulatory systems. The second limiting factor is the ability of the body to withstand lactate production.

**Muscle Hemoglobin**—Muscles may contain about 1 per cent hemoglobin which is almost saturated with oxygen at the oxygen tension of venous blood (40 mm. of mercury) and is loaded at the low tensions in cells most remote from capillaries. Muscle hemoglobin provides a local store of oxygen in sustained contractions when the blood flow of tensed muscles is interrupted the hemoglobin of muscle (myoglobin) takes oxygen much more readily than does blood hemoglobin. At an oxygen tension of 40 mm. of mercury, muscle hemoglobin is about 94 per cent saturated, whereas blood hemoglobin is only 60 per cent saturated. In rapidly acting muscles, rapid oxygen utilization is assured by increased concentration of enzymes (cytochrome oxidase systems).

The various current views can be summed up as follows: Glycolysis and oxidation in muscle are directed mainly toward the production of phosphate bond energy. Potential energy in this form is made available to the "contractile system" in order of immediacy, through the breakdown of adenosine triphosphate and phosphocreatine.

In activity, the initial energy requirements are met by adenosine triphosphate and phosphocreatine, but glycolysis and oxidation accelerate rapidly to meet the continuing energy requirements during activity.

Iodoacetic acid inhibits the oxidation of phosphoglyceraldehyde, and no lactic acid can be formed.

Muscles poisoned with iodoacetic acid could contract vigorously for a time before going into rigor without producing any lactic acid. In these circumstances, phosphocreatine breakdown is the principal unreversed energy-yielding reaction. Since phosphocreatine serves as the reservoir of bond phosphate for resynthesis of adenosine triphosphate, the latter must break down first when the muscle contracts.

Myosin is now believed to form the structural basis of the muscle machine and it is believed to be closely linked with the

breakdown of adenosine triphosphate, involving a large turnover of energy. The breakdown of adenosine triphosphate is the reaction nearest in time to the physical process of contraction. Addition of adenosine triphosphate to muscle increases its sensitivity not only to subsequent doses of acetylcholine but also to electrical stimulation in curarized muscles.

**Heat Liberated During Muscle Contraction.**—An activated muscle becomes warm. The amount of heat liberated is estimated in terms of calories. Analysis of records shows that heat is liberated in two portions: (1) initial heat and (2) delayed heat.

Initial heat is a sudden outburst at the very beginning of contraction and a slower but small portion during relaxation. Delayed heat occurs, after contraction and relaxation are over, during the period of recovery.

The initial heat is due to the chemical changes in the muscle liberated by the stimulus. This output of heat takes place in the complete absence of oxygen and hence must be due to monoxidative reactions.

The initial heat consists of two phases: (1) a sudden outburst which occurs at the very beginning of contraction and is practically over in 0.1 to 0.2 second; this is designed as the "contraction heat" and is associated presumably with dissociation of phosphocreatine; and (2) the smaller and more gradual heat production which takes place during relaxation or fall of tension and is called "relaxation heat"; this is due to dissipation, in the form of heat, of the mechanical potential energy of tension. It represents 35 per cent of the initial heat.

The delayed heat, at least in part, depends on the presence of oxygen. If the muscle is stimulated in an atmosphere of nitrogen, most of the delayed heat drops out. Delayed heat consists of two parts or phases; namely, (1) the anaerobic delayed heat which appears immediately at the end of the contraction and may be detected in either the presence or the absence of oxygen; it is small in amount, representing about 8 per cent of the initial heat; and (2) the oxygen recovery heat, which is much larger in amount, appears later and is lacking in the absence of oxygen. It depends on oxidative changes taking place in the muscle during the recovery period after the contraction is over. It is due to oxidation of lactic acid, the synthesis of phosphocreatine and the synthesis of lactic acid to glycogen.

If a muscle lifts a load, work is done which can be expressed in kilogram-meters, foot-pounds or any other convenient unit indicating the product of a weight by a height. The result can also be expressed in different terms by using the "mechanical equivalent of heat," namely, the fact that 426.5 kilogram-meters equal one large calorie.

If a muscle contracts against a strong resistance and cannot shorten, the work done is more difficult to measure directly. Since the tension, however, is dissipated as heat, one can determine the heat in calories and so obtain an indirect measure of the work.

#### ACTION OF MUSCLES IN THE BODY

Most of the voluntary contractions are too long continued to be simple contractions. The time element alone would place them in the group of tetanic contractions. Even the shortest possible voluntary contractions are brief tetanic contractions made up of a short-lasting series of contractions fused together.

Skeletal muscles act in the body by producing rotation of bony levers at the joint articulations. The lever system of the body is acted on by many external forces, including gravity, counterpressure of the floor and floor friction. To meet these forces, muscles must exert opposing forces in order to prevent movement and to maintain position.

In general, muscles are arranged in antagonistic pairs, about a joint, an arrangement which permits rotation of the levers in both directions through the utilization of muscle tension.

In a voluntary muscular act, four groups of muscles are concerned:

1. *Prime movers or agonists.* This comprises those muscles whose contraction is essentially responsible for the movement of a part.
2. *Antagonists* oppose the agonists.
3. *Synergists* assist the agonists and reduce unnecessary movement to a minimum.
4. *Fixation muscles* whose contraction causes the fixation of neighboring joints and maintains the part in a position appropriate for doing the act.

#### EFFICIENCY OF MUSCLES AS A WORK MACHINE

Efficiency indicates what percentage of the total energy given to an engine or developed in the engine may be ob-



tained as external or mechanical work. If  $Q$  equals total energy developed,  $W$  equals the energy (expressed in the same unit) obtained as work and  $E$  equals efficiency, then  $E$  equals  $\frac{W}{Q}$ .

Efficiency varies in different muscles and in the same muscle under different conditions. In very slow or very quick movements the efficiency is low, so that for any given task there is a certain rate at which the work can be done most economically.

The efficiency of human muscle ranges from 21 to 25 per cent. In determining the work done, one must apply the formula: work equals load times distance. If either load or distance is zero, no work is done. Also, there is an optimal load for each muscle with which the greatest proportion of work can be obtained. What measures the absolute power of a muscle? It is measured by the weight which the muscle cannot lift, and which, on the other hand, cannot cause any extension of the muscle while contracting. The absolute power of a muscle is the maximum of tension which it can reach without alteration of its natural length.

#### PHYSIOLOGIC EFFECTS OF MUSCULAR EXERCISE

Any observer realizes that strenuous muscular exertion leads to breathlessness, increase in heart rate, rise in body temperature and fatigue; but it takes a trained medical observer to be able to judge from the strenuousness of the exercise and the response of the person taking it as to how fit or unfit a man may be.

Under the influence of continued strenuous exercise, the oxygen consumption may rise from its resting value of 250 cc. per minute to a maximal value of 4 or more liters per minute; and in order to transfer 4 liters of oxygen from the lungs to the muscles, 34 liters of blood are required (100 cc. of blood carry about 18.5 cc. of oxygen, about 70 per cent of which is removed by the muscles). Consequently during severe exercise each side of the heart may have to pump 34 liters of blood per minute. Since the total volume of blood in the body is about 5 liters, it means that all the blood must circulate about seven times a minute. This indicates clearly that in severe exercise an enormous output of the heart is needed and any impairment in cardiac function is revealed by the inability of the subject to tolerate exercise of such severity. If the circulatory response to the demands of the muscles for oxygen during muscular exertion fails, the blood will be severely de-saturated (deoxygenated) and cyanosis develops. But an adequate response of the circulation is associated with a considerable increase in heart rate and in arterial blood pressure to drive the blood along the vascular tree.

The mechanical efficiency of the human body is only 25 per cent. This means that only a relatively small fraction of the chemical energy derived from oxidation is transformed into external mechanical work. The remainder is converted into heat. Most of the extra heat produced during exercise is lost from the skin and lungs, but some of the heat remains in the body and raises the body temperature. The magnitude of this rise in body temperature depends on the severity of the exercise and on conditions, such as clothing, obesity and humidity of environment, all of which may delay dissipation of heat from the body. This rise in body temperature speeds up most of the processes in the body, metabolic and otherwise, among them the frequency of the heart beat.

The rate of performance of long-continued severe physical work is limited by the maximal rate of oxygen intake and the output of the heart. However, the body can incur an "oxygen debt" during a short spurt of violent exertion by postponing the oxygen intake equivalent to the excess work until the period of recovery from the exertion. This indicates the existence of a mechanism whereby the muscles can perform work for a short time without deriving energy from simultaneous oxidation.

During recovery from any form of exertion an excess of oxygen over the resting oxygen consumption is taken. This indicates that for even moderate exercise oxygen debt is incurred. The duration of the recovery period depends on the duration and severity of the exertion, and on the "fitness" of the subject. It may vary from a few minutes to an hour or more.

The excess oxygen intake during the recovery process is necessarily accompanied with a greater circulation rate, in order that the oxygen may be transported from the lungs and distributed to the muscles. Therefore, the frequency of the heart-beat is considerably greater during exertion than at rest. The duration of the persistence of an increased heart rate during recovery from exercise is a valuable indication of the rate of

a man's recovery, and consequently his "fitness." It provides one of the convenient clinical tests by which the reserves of a patient may be recognized as in the pathologic or normal range.

The heart rate increases from the very onset of exercise and approaches a steady state in about two minutes. This initial increase is due largely to a nervous mechanism originating in the brain. It begins before the actual start of the exercise, during a period of anticipation of the action, and is due to influence from higher centers.

Delachaux and co-workers<sup>10</sup> reported that physical training produces changes, particularly in the lungs, circulatory apparatus and the products of cellular respiration. Some of these changes, they believe, protect the heart against overstrain. In well trained persons the peripheral resistance of the circulation is reduced, while a denser capillary network and a high intracellular hemin level create optimal conditions for metabolic exchange between blood and cells; consequently, the same amount of cardiac energy will supply more oxygen to the periphery in the trained than in the untrained. The heart muscle undergoes changes similar to skeletal muscle changes, greater vascularization and increase in intracellular hemin for carriage and storage of oxygen. The increase in respiratory products insures protection against oxygen deficiency during exertion. The heart hypertrophies, and, when intensive training ceases, the cardiac volume decreases gradually. Well trained athletes develop a definite bradycardia. During exercise their heart does not beat as fast as that of nonathletes. Muller<sup>11</sup> presented evidence that the bradycardia produced by training is due to peripheral changes in muscles; namely, better vascularization and oxygen utilization in the muscles used in training.

Schwartz and associates<sup>12</sup> demonstrated that systemic muscular exercise led to increase of height, weight and vital capacity of adolescent boys. In a study of the influence of exercise on the growth of organs in albino rats, Hatai<sup>13</sup> reported an increase of body weight and organ weights after continued exercise in cages for a period of six months. Born<sup>14</sup> studied a group of Yale men in their freshman and senior years. He concluded that systematic exercise increases body weight, shoulder breadth, vital capacity, girth and strength of the exercised muscles. Individual bones as well as the entire skeleton are modified by muscular exercise. Regular exercise increased the density of bones. Schneider<sup>3</sup> stated that a man in poor physical condition as easily exhausted by mental and physical exertion while a man in good physical state is mentally alert and physically vigorous and has bright eyes and a healthy complexion. Bainbridge<sup>15</sup> remarked that systematic exercise improves the whole muscular system and increases the range and delicacy of the adjustments of the respiratory and circulatory systems.

Following are some specific physiologic effects of coordinated and organized muscular activity on the muscle themselves.

1. *Muscle Structure.*—Regular and systematic exercise, especially when it is of a heavy nature, brings about definite changes in the structure of the muscles. It tends to thicken and toughen the sarcolemma of muscle fibers and also to increase the amount of connective tissue within the muscle. This is the basis for the tough and coarse meat of heavily worked animals as compared with those that were confined and inactive throughout their lives.

2. *Muscle Size.*—Muscular activity brings about a definite increase in the size of the whole muscle and of its individual fibers. This increase in size of the muscle is due partly to the improved circulation and partly to the chemical changes occurring during repeated activity of the muscles. Training does not increase the number of muscle fibers, but it brings about an activation of the unused fibers that have become small from lack of use. Consequently, these repeatedly activated fibers increase in size and become well developed. Some believe<sup>5</sup> that this increase in the size of the muscle is due to an increase in the number of capillaries resulting from the repeated exercise; and it is stated that the exercises of strength induce hypertrophy of the muscle fibers, and the exercises of endurance induce capillarization.<sup>16</sup>

3. *Increase in Strength.*—In order to develop strength of muscles, they must be exercised against gradually increasing resistance. It must also be remembered that the rapidity and ultimate degree of development of the muscles in different persons differs. Usually persons with small bones who are tall and thin, will reach the limit of development much sooner than a stocky person with large bones. However, this is not the only explanation. There are other unknown factors that cannot be explained.

4. *Gain in Endurance.*—The increase in absolute strength of an individual or a group of muscles does not necessarily mean a gain in endurance. The strong man can perform work against greater resistance, but if the weights to be lifted or the exercise to be done is of medium load, a person with less powerful muscles may be the champion. Often it is found that the gain in endurance is out of all proportion to the gain in size of the muscle. It must be remembered that the increase in endurance is probably due to the improvement of the quality of contractions of the muscles, which is brought about by training. This improvement in quality is often associated with actual chemical changes, by means of which (a) the fuel for muscular activity may be made more available, or (b) the fuel is stored in greater amounts, or (c) the oxygen is more abundant because of a greater adequacy of circulating blood through the muscles. It has been shown that training which brings about a gain in endurance also leads to an increase in the number of capillaries in the muscles. Maisson and Broeker<sup>17</sup> demonstrated that the endurance of muscles with adequate blood supply increased more rapidly and reached a higher level than those without adequate blood supply. Their experiments have suggested that important changes take place during exercise and that an adequate blood supply is essential for these changes.

5. *Chemical Changes.*—It has been shown experimentally on rabbits that the training of muscles for a period of five days was sufficient to bring about a definite increase in the phosphocreatine content.<sup>18</sup> Also, it has been shown experimentally that exercising the muscles invariably resulted in a greater content of glycogen.<sup>19</sup> Furthermore, the quantity of non-nitrogenous substances was increased during training, and the color of the trained muscles was darker than that of the untrained. This indicates a more favorable state for the transport and utilization of oxygen, because the color of the muscle is due to its hemoglobin content. Whipple<sup>20</sup> found that a greater amount of hemoglobin is present in the muscles of active dogs than in inactive ones. The muscles of active, trained dogs were found to contain up to 1,000 mg. of hemoglobin per 100 gm. of muscle, while in the quiet house dog the muscles contained about 400 mg.

6. *Facilitation of End-plate Transmission.*—Some have suggested that the facility of transmission of nerve impulses across motor end-plates in muscles is usually brought about by systematic muscular exercise. This is difficult to prove.

7. *More Nearly Complete Use of Muscle Fibers.*—It has been assumed, also, that as the end-plate transmission is improved and inactive fibers are brought into action it becomes much easier for the muscle fibers to be put into action in their entirety. This, of course, suggests that a muscle whose fibers have been brought into action altogether is much stronger than one containing many idle fibers.

8. *Increase in Number of Capillaries.*—In the heart and in the gastrocnemius muscle the number of capillaries was found to be 40 to 45 per cent more in the trained than in the untrained animals (guinea pigs). This led to the conclusion that the gain in endurance is mainly a problem of improving the transport of blood to the muscles through an increase in the number of capillaries.

The important physiologic effects of systematic physical exercise can be summarized as follows: (1) Effort can be withstood for a much longer period without exhaustion by the trained than by the untrained person. (2) The resting heart rate becomes so slow that a definite bradycardia occurs in well trained athletes. (3) Greater stroke volume of the ventricles makes it necessary for the heart to speed up considerably to cope with the demands of moderate exertion. (4) The heart rate and blood pressure return to resting levels much more rapidly on cessation of physical activity in the trained than in the untrained person. (5) Rate and depth of respiration during rest are usually slightly reduced in well trained athletes. (6) During moderate exertion pulmonary ventilation is not noticeably labored, and during exhausting work a greater minute volume of ventilation is attained in the trained than in the untrained person. (7) Oxygen utilization is more efficient and energy reserves are more effectively utilized anaerobically in the trained than in the untrained person. (8) The concentration of blood lactate does not rise very high during moderate activity and a higher concentration of blood lactate can be withstood for long periods without any signs of exhaustion during severe exertion in the trained than in the untrained person.

*Fatigue* is a state during which a muscle fails to respond

to stimulation. During the onset of fatigue a muscle relaxes more and more until it becomes completely unresponsive. But a short interval of rest is sufficient to bring about some return of irritability. For complete restoration, a long interval of rest is necessary. Products of muscular activity accumulate in muscle and lead to depression of its irritability and contractility. Lactic acid is one of the important products. Other unknown products of muscular metabolism also have a similar effect. Accumulation of lactic acid in the muscle, and consequently in the blood, indicates that the oxygen supply to the contracting muscles is inadequate. The muscles accumulate an oxygen debt owing to their ability to contract anaerobically. The more strenuous the exercise, the more insufficient is the oxygen supply; this is indicated by a rise in the value for lactic acid in the blood. The supply of energy-yielding material has been depleted. The processes of restoration have not kept pace with those of consumption. In this sense there is a real exhaustion of the muscle. But fatigue appears on accumulation of lactic acid, while the muscle still contains energy-yielding material.

Extreme fatigue or exhaustion is normally prevented by the fact that the nerve centers and motor end-plates develop the phenomena of fatigue before the muscles themselves do and, therefore, there is hardly ever a condition of extreme exhaustion.

#### THE PHYSIOLOGIC BACKGROUND OF FATIGUE

Fatigued muscles lose irritability and contractility. This fatigue is due to the consumption of all available contractile materials and to the accumulation of fatigue products formed during metabolic activity. The presence of these products may be due either to overproduction of wastes or to faulty elimination. The faulty elimination may be due to maintained tetanic contractions or to interference with the circulation. It is important to keep in mind the fact that a muscle has the least blood supply and is least capable of eliminating its wastes and replenishing its nutritive elements during the contraction phase. Therefore, the less the contraction phase is maintained, the better is the outcome for the muscle.

The following parts are to be considered in fatigue: (1) the motor nerve cell, (2) the synapses, (3) the motor nerve fiber, (4) the motor end-plate and (5) the muscle itself. Regarding the nerve fiber, there is sufficient evidence to indicate that it does not fatigue readily. Its metabolism, even under activity, is exceedingly small. The synapses, the motor end-plate and the muscle itself are the seats of fatigue, especially the motor end-plate, which fatigues most easily. Experiments were made by paralyzing the end-plates with curare and then stimulating the nerve. Nerve stimulation was carried on for more than six hours, and as soon as the curare effect wore off muscular contraction appeared. This indicated that even continuous activation of the nerve for six hours did not fatigue it. The myoneural junction is generally held as a very important seat of fatigue.

Following are some of the major factors which influence the progress of fatigue. (1) Frequency of contraction. The greater the rate of activation of a muscle, the more rapid is the onset of fatigue. During contraction the muscle is least capable of replenishing its circulation. (2) The completeness of exhaustion. The more complete the exhaustion, whether it is mental or muscular, the longer is the period necessary for recovery. (3) The load. The greater the load, the more rapid the onset of fatigue and the smaller is the total amount of work done. Poor circulation reduces the working power of the muscle and causes it to fatigue earlier. (4) The work capacity is increased by rest, moderately low external temperature, training and massage. Increased arterial pressure also reduces fatigue. Strenuous work decreases muscle tone and brings about fatigue early.

*Breathlessness.*—Breathlessness is manifested during extremely strenuous exertion (1) when large groups of muscles are actively used, (2) when respiration is interfered with mechanically, or (3) when anxiety, fear and excitement are present, or when any two, or all three, conditions are in effect concurrently. Breathlessness is more likely to occur in persons who are not in good athletic trim or are in poor physical shape.

Lack of oxygen, great reduction of lung surface and limitation of thoracic movement (for example, thoracic disease, or ossification of the thorax leading to rigidity) the limitations of excursions cause breathlessness. Congestion of the pulmonary system and the other vessels in the thorax lessen the room for air.

The inability of the heart to bring the blood rapidly enough to the lungs or to take it to the tissues because of valvular



lesion or weakened myocardium makes an important cause for breathlessness.

Chemical changes in the blood leading to an increased acidity, the rise in body temperature and the impulses from higher centers and from contracting muscles all drive the respiratory center to breathlessness. Accumulation of lactic acid in the blood is another factor causing breathlessness.

**Second Wind.**—Second wind occurs during vigorous exercise. The dyspnea and breathlessness diminish at a certain stage during severe work and the subject continues the exercise with greater comfort. The percentage of carbon dioxide in alveolar air decreases after second wind occurs.<sup>21</sup> With the arrival of second wind, cardiac distress disappears, the breathing becomes easier and sweating usually begins. The cause of second wind is unknown. Second wind may occur when sufficient oxygen is supplied to the muscles to eliminate the excess lactic acid. The increased temperature in the muscles would stimulate chemical processes. The larger flow in the dilated capillaries would bring oxygen to aid in the elimination of the lactic acid. Hartman and co-workers<sup>22</sup> suggested that the second wind and the warming up process are accompanied with an increase in the output of epinephrine. Hoskins and Durrant<sup>23</sup> demonstrated that epinephrine increased the activity of skeletal muscles.

Second wind is apparently an adjustment of all the coordinating mechanisms in the heart, lungs, muscles, metabolism, elimination and nervous system. Failure of any of these causes breathlessness. A trained athlete has complete adjustment of these mechanisms.

**Muscle Pain, Soreness and Stiffness.**—Muscle pain is characterized by aching. It is well known by those who have overused muscles unaccustomed to an activity for the first time on a previous day. The pain produced by injury to web, tendon, periosteum, joints and deep fascia is similar to muscle pain; it is deep, gnawing in character. Usually, muscles are known to ache and tendons to hurt.

All joint pain arises in synovial membrane, as articular cartilage is relatively insensitive. The pain of arthritis is deep and boring. Only pain in superficial structures is well localized. Pain in deep structures is poorly localized and it possesses two components, the primary pain and the secondary pain, but may be referred to another part of the body altogether. The deeper the source of the pain, the poorer is the localization.

**Mechanism of Muscle Pain.**<sup>24</sup>—The muscle spindles in muscle and the organs of Golgi in the tendons are stimulated by changes of tension, whether these are produced actively as a result of contraction or passively by means of stretch. Stimulation of receptors other than those specifically concerned with pain cannot give rise to pain sensations. Little is known about the pain nerve endings in muscle. Hinsey<sup>25</sup> reported that free nerve endings are found around the blood vessels in muscle and in the aponeurotic sheaths and subserve pain in these localities. The mode of action of sensory organs in skin as well as in muscle is explained by the presence of specific types of nerve endings which respond to an appropriate and specific stimulus and to none other. There is doubt whether the cortex mediates pain sensation; it is more probable that the seat of pain is mainly in the thalamus. The intensity of the sensation depends on the frequency of the impulses set up in the peripheral sense organ. The extent of the area stimulated is judged from the number of afferent fibers simultaneously activated.

Three types of somatic pain are recognized: they come from skin, muscle and tendon, respectively. Muscle pain, with which we are especially concerned here, could be continuous, diffuse and difficult to locate. It is different from skin pain. It can be produced by exercising a muscle under ischemic conditions, squeezing a muscle violently, or injecting into it hypertonic or acid isotonic saline solutions. Muscle pain may be referred to distant parts. Stimulation of tendon or periosteum produces similar pain to the type known as web pain, which is elicited by pinching the short web of skin between adjacent fingers. Kellgren<sup>26</sup> reemphasized the presence of tender spots in myalgia or fibrositis, which, when pressed upon, give rise to diffuse widespread pain which is of a referred character. When the tender spots are infiltrated with a local anesthetic, both local and referred pain disappear. This may account for the beneficial effect of massage and of radiation therapy applied to localized tender spots which are probably the actual foci of the disease. Lewis<sup>27</sup> made a study of the mechanism of ischemic pain. He exercised the hand after entire occlusion of the circulation to the arm. Pain set in after about thirty seconds and be-

came intolerable in seventy seconds. It was diffusely felt, but most marked in the muscles. It is not due to vascular spasm, because, after occlusion, the blood vessels lose their tone. It is not due to muscular tension, because it is continuous and is not accentuated during the phase of contraction. It is the result of activity, because it is related to the amount of exercise which is performed. It is not due to local anoxia. If the limb is exercised to a point short of pain and the occlusion kept up, no pain develops, although the anoxia becomes progressively more intense. Activity liberates a pain-producing factor (P) which normally passes into the tissue spaces and is removed by the blood stream. The substances accumulate in conditions of ischemia and give rise to pain.

Despite the fact that life is made miserable for hundreds of thousands of chronically stiff, aching muscles, very little is known about the altered physiology of diseased muscles even in common states, such as muscular rheumatism. Muscle biopsy is easily performed but the information obtained so far does not help. Physiologic reactions of muscles are fairly well known, but very little is known for the treatment or understanding of muscle diseases.

Muscles soreness is of two types: (1) general soreness due to the presence of diffusible waste products and (2) soreness due to ruptures within the muscle fiber or the fibrous covering and attachments of the muscle to the bones. The pain due to accumulation of waste products in the muscle is most severe during work. About one-half hour after the exercise the muscle is lame and sore to touch. The pain and discomfort gradually wear off during the first four hours after the exercise and then disappear completely.

The second type of soreness is not noticed during the exercise nor for several hours after the exercise. It begins toward the end of the day or on the second day after the activity when the muscles feel stiff and sore. The soreness may disappear in three or four days, or may last longer if the work was very severe. Boyle and Scott<sup>28</sup> stated that, although there are vascular and lymph changes in muscle as a result of exercise, this type of muscle soreness is not due to metabolic products accumulated in the muscle.

The general type of soreness is considered to be due to the accumulation of waste products within the sarcolemma and later within the interstitial lymph spaces. This edema of the muscle continues until the blood and lymph currents can remove the waste products from the muscle. Pressure of the swollen muscle fibers on the sensory nerve endings, or the chemical stimulation of these endings by the waste products, causes the soreness. Mild work through alternate contractions forces the waste products out of the area and allows fresh blood to enter with needed nutriment. Massage here helps.

The second kind of soreness is caused by rupture of muscle fibers which are less often used and are more susceptible to strain than the fibers regularly used in ordinary contractions. The persistence of the soreness may be due to the breaking up of adhesions between the injured fibers. This type of soreness needs rest and heat and only enough contractions to prevent adhesions between the sore muscle fibers. Slow contractions avoid tearing the adhesions and may stretch them without severe pain.

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JOHN A. SCHILLING, "The Healing of Wounds," Office of Naval Research Research Reviews, September, 1952, pp. 12-18.

During the first few hours a wound is filled with a blood clot containing a fibrin network, white cells and serum. This is an ideal medium for the growth of bacteria. Consequently a critical struggle occurs between the contaminating bacteria and the host. Ordinarily wounds are repaired in their deeper portions by fibrosis and covered superficially by regeneration of skin or mucous membranes. Following a lag period of 24 to 36 hours after the wound is inflicted, there is a multiplication of young fibroblasts and small capillaries (granulation tissue) which ultimately fill the space in the wound. The fibroblasts increase at a rapid rate during the next 7 to 10 days, greatly increasing the strength of the wound, which reaches its maximum toughness 14 to 18 days after it was inflicted. During this time the new fibroblasts are laying down a ground substance of tough fibers called collagen. These sometimes cause a contraction of the skin which necessitates surgical correction. After two weeks the activity of the fibroblasts slows down, skin by regeneration covers the surface, and slowly the capillaries are squeezed out by the collagen fibers, ultimately changing the red scar to white.

Nothing is known that will accelerate these normal mechanisms significantly, although infection, lack of Vitamin C, lack of adequate body proteins and various local factors will slow them down. Experiments on rats have led to the establishment of a curve for the closure of an excised superficial wound that is statistically valid.

PJR

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# Editorials

## BASIC CONCEPTS OF REHABILITATION

At the Sixth Annual Clinical and Scientific conference of our Association, notable progress and professional growth were made. This issue of the Journal is devoted to a review of some of the basic concepts of rehabilitation that were expounded and accepted by representatives from medicine, industry and corrective therapy. Not in years have so many workers from these three disciplines—responsible for medical restoration and resocialization of the disabled—become so keenly aware of the joint responsibility of each to help the disabled “make a future with what they have left.”

Throughout the many stimulating panel discussions the recognition of man's unrelenting search for happiness, as a basic concept to be dealt with in his rehabilitation, was continuously evident. Happiness alone is far from the answer to his total rehabilitation. Someone has said, “We have no more right to consume happiness without producing it than to consume wealth without producing it.” If we accept this as one of the basic concepts, we immediately recognize another fact—the importance for both patient and therapist of restoring happiness by such therapeutic methods as will help the patient to help himself. “There is nothing truly valuable which can be purchased without pains or labour.” Addison must be given credit for this truism, which shows a third essential concept of rehabilitation—the value of re-employment in rehabilitation.

The early recognition of the necessity for determining the rehabilitation potential puts meaning and purpose into this medical restoration and resocialization process which we call rehabilitation. During this process the therapist in his daily work with patients must become aware of the progress toward the original goals and recognize the need for re-evaluation and possible restatement of new objectives. The therapist must recognize the need for cooperative, dynamic effort by medicine, the adjunctive therapies and industry.

It is essential for the patient and therapist to anticipate re-employment. Re-employment is the ultimate goal in all rehabilitation within the limits of the patient's disability or handicap. Unless goals commensurate with the patient's capacity become established early, a much longer convalescence will result. The re-evaluation of these goals should be frequent to eliminate plateaus of discouragement. It is of fundamental importance that the cooperation of medicine, the adjunctive therapies and industry be recognized, accepted, and with persistence be accomplished, if the rehabilitation of the patient in the

shortest time is to be achieved.

Another essential idea is recognition of the fact that the most effective motivation comes from within. It has been demonstrated many times that if you change your thoughts, you change everything. “As a man thinketh in his heart, so is he.” This has been guiding men to peace of mind, happiness and personal adequacy for many centuries.

Our Association membership, assembled at Milwaukee, applauded the scientific and stimulating discussions of synergetic factors in rehabilitation, the approach of physiatry to rehabilitation, emotional concomitants of rehabilitation, contributions of psychology to the understanding of the patient and his treatment, and social determinants in rehabilitation. The membership will undoubtedly return to the interesting work of the corrective therapist, who sees the whole personality of man after disaster strikes, and will recognize these basic concepts of rehabilitation as precepts to guide him in the busy days ahead.

The reappearance of new horizons reaffirms the need for: analyzing the job to be done; re-evaluating the tools required to do it; determining adequate educational standards; an appreciation of the dependence of each discipline upon the other and the sustained belief that the joint responsibility for the solution of these problems exists. The full significance of the recognition of these problems is shown in the liberal offerings of the panel discussions that took place.

Physical and Mental Rehabilitation is a community, state, and national responsibility. The host city of Milwaukee, Wisconsin is setting a pace in the awakening of community consciousness to the problems of medical restoration and resocialization that are to be found awaiting solution everywhere.

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## PROFESSIONAL PAPERS

With a view towards the continuous improvement of the Journal of this Association, your editor, Mr. E. M. Sanders, discussed the matter of obtaining more professional papers before the Representative Assembly at the recent Milwaukee meeting.

In the ensuing discussions the following points were brought up:

- a. Exercise and activity techniques being developed under the direction of the doctor in a constantly enlarging area of medicine and rehabilitation are providing an important basis for the improvement of current medical practices.
- b. Members of the various activity therapy disciplines, as a result of their daily work at the clinical practice level, are gaining experience



and therapeutic material of the greatest value and significance.

- c. This clinical information should by all means be disseminated so that therapists may be able to benefit by the experiences of those in similar and related fields.

These statements point to one significant conclusion, we who are privileged to work at the hospital level have an excellent opportunity to supply technical and professional information both to our fellow therapists and to the field at large.

In order to take advantage of this situation, your officers make the following recommendation: The Corrective Therapy Section of each hospital become responsible for the preparation of one major paper a year relating directly or indirectly to their discipline. This paper would enable the section to report upon any special therapeutic project being developed in their station, it would stimulate the professional interest and growth of the particular group and would provide another facet whereby corrective therapy can explain its rationale, technique and operations.

Such a plan if it meets with the sincere coopera-

tion of the Corrective Therapy Sections and the exercise therapists in other installations would provide your Editor with a backlog of significant professional articles written upon the clinical level and would enable the editorial staff to continue the fine progress being made to constantly improve our professional journal. Articles prepared in collaboration with the physician would be particularly valuable for this purpose.

One can hardly overestimate the importance of a sincere and positive cooperation upon the part of every therapist both for his own professional advancement and the progress of our discipline. Every Corrective Therapy Section is exposed to a constantly learning situation in which much clinical material of an exploratory nature along with conventional techniques provides the basis for valuable papers on therapy. Your Editor deserves your assistance and we owe it to ourselves to give genuine support to this proposal. Let us call our staff together and formulate a plan for this purpose.

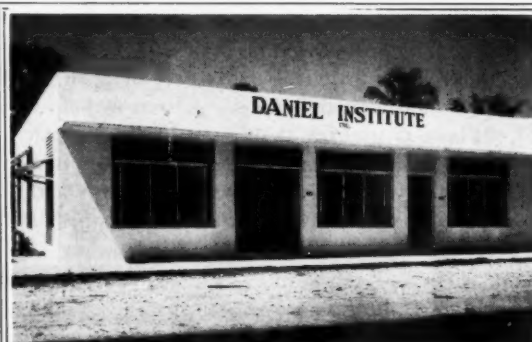
John Eisele Davis, Sc.D.

#### NOTICE TO MEMBERS

The following proposals governing membership control were adopted unanimously at the meeting of the Representative Assembly on July 7, 1952 at the Hotel Schroeder, Milwaukee, Wisconsin. They have been forwarded to the constitution committee and are to be incorporated into the by-laws of the association. They have gone into effect as of October 1, 1952.

1. If a member fails to renew and becomes delinquent sixty days after his expiration date, he must pay the penalty of one dollar plus his current dues if he renews within a six-month period.
2. After the six-month period he must re-apply as a new member and satisfy any and all requirements for membership, even if more stringent than at the time he originally became a member. He must also pay the current year's dues plus the penalty of one dollar.
3. If a man decides to leave the field of corrective therapy, he may write a letter to the secretary and resign in good standing for a period of three years. He may be reinstated at any time within that period by making application and paying the current year's dues. After three years he may be reinstated by fulfilling the constitutional requirements for membership at the date of application for reinstatement and by payment of the current year's dues.

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## Chapter Activities

### SOUTHEASTERN CHAPTER MEETING AT TUSKEGEE V. A. HOSPITAL

Corrective therapists from all points in the Southeastern Area attended a very stimulating meeting at Tuskegee, Alabama. The sessions were well attended by visiting physiatrists and other representatives of the ancillary therapies. Mr. William A. Clark, executive assistant at Tuskegee, served as general chairman and arranged the best program yet presented at one of these annual meetings.

Dr. T. T. Tildon, manager, greeted all guests warmly and welcomed them at the opening of the Third Annual Scientific Conference. President Roy L. Hilliard gave the response for the chapter.

Dr. Frederick J. Balsam, Assistant Chief PMR at Kennedy V. A. Hospital, made the keynote address and gave an inspiring talk on the conference theme, "The Team Approach to the Rehabilitation Process."

"Rehabilitation of Mental Patients" was the subject of an interesting panel discussion. Dr. Alan P. Smith, Chief of the Intensive Treatment Service at Tuskegee, served as moderator. Others who sat in on the panel were: Dr. G. C. Looney, ward physician; Dr. H. F. Davis, Chief PMR; Mr. Lonis C. Ballard, chief of CT; Dr. R. L. Francis, neurology service; all staff members at Tuskegee. Mr. Phil R. Davis, executive assistant PMR at Augusta V. A. Hospital, read a paper for Dr. W. V. Walsh of that hospital who was unable to attend. All members of the panel agreed that prescribed activities were important in the treatment of mental patients. It was brought out emphatically that all members of the rehabilitation team should be carefully screened as to their fitness for working with mental patients.

Dr. J. F. Hume, Chief of Orthopedic Service at Tuskegee, presented an excellent film on the rehabilitation of an arthritic patient following a mold arthroplasty of the hip.

Jessie J. Johnson, Ph.D., gave an interesting talk on "The Contributions of Clinical Psychology to a Hospital Rehabilitation Program."

Dr. Harriett E. Gillette, medical director of the Physical Medicine Rehabilitation Clinic at Atlanta, Georgia, was the banquet speaker at a fine dinner served in the staff dining room. She gave a most interesting talk on neuro-physiology and its clinical applications to an exercise program for handicapped patients. In addition to being a top-notch banquet speaker Dr. Gillette proved to be a lady of great charm, and the chapter was honored to have her as the guest speaker.

In the afternoon session Dr. Erma R. Smith, Chief PMR at Dublin VAH, discussed "Deconditioning Resulting From Inactivity and Methods of Prevention."

Mr. E. M. Sanders, Chief CT at Kennedy VAH and Editor of the Journal of the Association for Physical and Mental Rehabilitation, gave a scholarly talk on "Opportunities and Needs for Research in Medical Rehabilitation." Everyone present was inspired by the need for conducting research in corrective therapy.

Between eighty and ninety people attended the morning session including a delegation of students from the Tuskegee Institute. The afternoon session was attended by about fifty.

Saturday evening following the conference a physiatrist and three therapists were standing at the foot of a statue of Booker T. Washington located on the campus of the Tuskegee Institute. They discussed the good work being done by the all-negro staff at the adjacent V. A. hospital and pondered over the words of the inscription below the statue. "There is no defense or security for any of us except in the highest intelligence and development of all. We shall prosper in proportion as we learn to dignify and glorify labor and put brains and skill into the common occupations of life." It was agreed by all present that this great humanitarian and benefactor of the negro race knew something about rehabilitation himself.



## Book Reviews



THE YEARBOOK OF PHYSICAL MEDICINE AND REHABILITATION 1951, By Frank H. Krusen, M.D., Earl G. Elkins, M.D., and George G. Deaver, M.D., 66., 382, 160 illustrations, \$5.00, Yearbook Publishers, Chicago, Ill.

The Year Book is a compilation of modern advances in the diagnostic and therapeutic procedures being used successfully in the field of Physical Medicine and Rehabilitation. The authors have selected specific articles from Journals and abstracted the pertinent information which is discussed in the text.

It is interesting to note that nine articles published in The Journal of the Association for Physical and Mental Rehabilitation, during the year of 1951, were selected by the authors of The Yearbook.

The factual information contained in this book should be of interest to every therapist, physician, and worker in the field of Rehabilitation. Many topics discussed are interesting, informative, and an excellent reference source.

AT

BLAKISTON'S ILLUSTRATED POCKET MEDICAL DICTIONARY. By Norman L. Hoerr, Ph.D., Samuel W. Chase, Ph.D., Carl C. Francis, M.D., Marion G. Howell, L.D., and Laura E. Moore, Plain, \$3.25; Indexed, \$3.75; pp., 1,032, 60 illustrations, 16 in color, Blakiston Co., Philadelphia 5, Pa.

This is a brand new dictionary with full, unabridged definitions of over 33,000 medical terms necessary for a full medical vocabulary. Unlike other pocket dictionaries, every entry and important sub-entry is thoroughly and completely defined as in large dictionaries.

This book contains the latest additions to the medical vocabulary in addition to the most frequently used terminology. Other valuable information is included for convenient ready reference such as colorful anatomical charts and tabular information.

Blakiston's Pocket Dictionary is an excellent reference for therapists, medical social workers, nurses, physical education teachers and all others in the field of medicine.

JOHN W. MASLEY, "Research—What Is It?", *The Physical Educator*, 8:101-102, December, 1951.

Research is an orderly and systematic means of solving problems. Fundamental research is directed toward expanding the horizon of knowledge and understanding through application of scientific thinking in a particular field. Applied research is the careful use of this knowledge to solve immediate problems. Research in health, physical education and recreation must contribute facts and principles on which sound practices and a well founded philosophy can be based. It must also contribute to the development of personnel capable of attacking the many problems which face the profession. Many of our present day practices and programs in physical education have their basis in tradition, convenience or emotion. Other practices are based upon misapplied knowledge. In a profession which deals with and affects the lives of many people, we cannot afford to be unscientific. We are bound to examine our practices to insure that they are the best, consistent with present knowledge. We can do this only if we have an understanding of research and apply the scientific method to the solution of our problems.

PJR

CLETUS L. KRAG and WILLIAM B. KOUNTZ, "Stability of Body Function in the Aged II. Effect of Exposure of the Body to Heat," *Journal of Gerontology*, 7:61-70, January, 1952.

Observations were made of 14 subjects aged 57 to 95 and 12 aged 21 to 35 who were exposed to heat by means of a Burdick Fever Therapy Cabinet producing a temperature of 100-115 F. The aged showed a greater delay in recovery time of rectal and oral temperatures, higher rate of respiratory movements, slightly lower increase above the basal level of oxygen consumption, and a slightly lower pulse rate than did the younger group.

PJR

## News and Comments



### INSTRUCTIONS FOR FILING APPLICATIONS FOR EXERCISE THERAPIST POSITIONS

All applicants for the position of Exercise Therapist with the Federal Government are urged to follow the procedure outlined in Civil Service Announcement No. 299. This procedure will prevent delay in your being considered for appointment. In many cases applications, more commonly referred to as the "Form 57," have been received at the hospital level either by the Chiefs of Corrective Therapy Sections or the local personnel offices. As a result much delay is encountered in processing the applicant's certificate of eligibility since no action can be effected at the hospital level other than to forward the application to Washington for Central Office action. The routine which should be followed is outlined in Announcement No. 299 entitled "Exercise Therapist," which is posted in all first and second class post offices. Copies of the examination may be secured by writing directly to Central Office, however if the applicant meets all requirements as outlined in the Announcement and no further information is required, he need only prepare a form 57 and a 5001 ABC card. If there is preference as to location of employment this should be indicated on the form 57.

Upon qualification the applicant's name is placed on the Register of Eligibles as an Exercise Therapist. When vacancies occur in the field lists of eligibles are secured from the Register by the personnel office of the field station seeking employees. Selection must be made from this Register, or the position at least offered to those applicants listed, before field stations can hire on the "Open Market." Following the procedure as outlined in Announcement No. 299 will expedite action on your application and increase chances for your employment because of the wide distribution of the Register lists. Address all correspondence concerning this matter to: Executive Secretary, Central Board of United States Civil Service Commission Examiners, Veterans Administration, Washington, 25 D. C.

### PROGRAM FOR THE SEVENTH ANNUAL CLINICAL AND SCIENTIFIC CONFERENCE

Your program committee is laying out the board outlines of the clinical session for the Washington meeting to be held at The Hotel Mayflower, July 20-24 inclusive, 1953.

The Milwaukee meeting set a standard of professional accomplishment which in terms of comprehensiveness of topics discussed and the quality of clinical presentation will be hard if not impossible to duplicate. It is only with the active assistance of every therapist in our organization that we will be able to perpetuate and continue the advancement of our discipline at this high level. In general, our present plans call for clinical symposia as comprising the major part of the program with a few key presentations of individual papers, along with demonstrations, movies and other visual aide material. Dr. Alan Gregg has met with your chairman and has given the benefit of his wisdom and medical discernment in suggesting certain panel discussions. We are most fortunate in being able to rely upon Dr. Gregg to give us advice as the program develops. We will count heavily upon his assistance, and that of our Advisory Board.

As to the content of the clinical material, consideration is being given to a comprehensive list of medical and rehabilitation topics stressing current progressive developments of corrective therapy as an integral and important part of Physical Medicine and Rehabilitation, Psychiatry, neurology, orthopedics, general medicine and surgery and the related disciplines of nursing, social service, and psychology will have representation of their views and practices.

While such assistance and guidance is indispensable, the success of this clinical program depends primarily upon you, the exercise therapists. While there is evident need for discussions of medical principles and rationale, a complete program requires the exposition of activity techniques along with the psychological factors of motivation and interest. As a result

of daily working with patients, the exercise therapist is amassing a wealth of clinical experience the reporting of which is of increasing significance to medicine. The program committee solicits your cooperation and assistance in supplying this important data. Your ideas as to specific subjects and subtopics for panel discussions, suggestions as to participants will be most helpful. Let us make this program thoroughly representative of our discipline. Address communications to: John E. Davis, Sc. D., Chairman Program Committee, APMR, 3423 S. Utah Street, Arlington, Va.

### WALTER REED AMPUTEES HELPED BY NEW 'TEAM' APPROACH

At Walter Reed the amputee is no longer a "displaced person," being shuttled around from surgery to prosthetic fitting and then to physical medicine, with each section doing different and unrelated things. Today this hospital combines all this in a "team" approach to the amputee problems. Under this up-to-date system surgeons work with prosthetic engineers and physical medicine personnel in devising the best type of treatment for each veteran. Conferences are held weekly with the patient as the key man on the team. The team works with the patient from before the time of amputation through final fitting of the limb. Lt. Colonel John L. Kuitert, chief of PMRS at the hospital, lists the essential elements for rehabilitation as physical restoration, prosthetic fitting and training and selective job placement. Marked success in the field of cineplasty is also reported. This operation, the isolating of a muscle and attaching cables through a "tunnel" in the muscle to operate artificial hands or hooks, and use of the prosthesis attached affords the patient a sense of feeling entirely lacking in ordinary prosthetic appliances. Besides giving the amputee a sense of touch, the tunnel operation means fewer cumbersome straps, cables and other attachments. By building strength in the tunneled muscle, weights of 100 pounds may be lifted and with proper training and practice the other extreme may be reached and a potato chip be picked up without crushing.

### THIRD ANNUAL CONVENTION OF AART

The third annual convention was held at the Statler Hotel, New York City, Sept. 2-5, 1952. Rehabilitation Therapists from all over the nation met and exchanged knowledge and experiences with the one objective of improving their services to the disabled and handicapped. Outstanding specialists from the field of physical medicine, representing V.A. state and private hospitals, clinics and curative workshops addressed the convention. During the past year the membership of the AART has more than doubled with new members from the fields of education, occupational therapy, physical therapy, corrective therapy, manual arts, blind rehabilitation, music, and speech. The members move forward with increased effort and enthusiasm toward objectives which were established at the convention. The new president is James N. Burrows, Executive Assistant, PMRS, VAH, Hines, Illinois.

### DR. KESSLER NAMED AWARD WINNER BY PRESIDENT

Dr. Henry H. Kessler, medical director of the Kessler Institute, Pleasant Valley Way, West Orange, New Jersey, has been named first recipient of an annual award to be presented to the physician who has contributed most to the employment of the handicapped. Announcement of the award was made by the President of the United States at a meeting of the President's Committee on Employment of the Physically Handicapped which was held in Washington last month.

The actual award will be presented at a meeting of the medical profession this fall or winter. Dr. Kessler was chosen from among several nominees from the various states by a committee composed of physicians.

Dr. Kessler has been an active member of our editorial board for the past seven years. We, of the Association, extend hearty congratulations to Dr. Kessler for this national recognition of outstanding accomplishment.

### NEWS FROM KESSLER INSTITUTE

The Kessler Institute for Rehabilitation announces the publication of the first issue of its new annual medical magazine, *Proceedings of the Kessler Institute for Rehabilitation*. The current issue, devoted to a "Clinic on Paraplegia," presents an integrated program of medical care for paraplegics (patients paralyzed below the waist) that was developed at the Kessler Institute.

Over five thousand physicians, hospitals, and other interested medical groups will receive copies of the magazine early this month. The publication is being sent without charge, as a professional education service of the Kessler Institute. Single copies will be available on request from the Kessler Institute for Rehabilitation, Pleasant Valley Way, West Orange, New Jersey, until the supply is exhausted. Distribution of the *Proceedings* is being limited to medical and ancillary personnel.

Henry H. Kessler, M.D., Medical Director of the Kessler Institute, is editor of the magazine, with Trudy Drucker as assistant editor. The Kessler Institute also publishes *Comeback*, a monthly magazine for lay and professional readers, and a series of technical training manuals for the rehabilitation profession.

In the Foreword, Dr. Kessler points out the paraplegia, although usually considered to be a veterans' problem, is actually a civilian problem; there are at least ten paraplegics among the civilian population for every paraplegic veteran. It is essential that this large group of severely disabled patients receive the same type of integrated, total care and rehabilitation that is provided for veterans in the various excellent Veterans Administration Hospitals.

"At least half of the patients at the Kessler Institute for Rehabilitation are paraplegics," Says Dr. Kessler. "We believe that our experiences with this group may be valuable to other physicians. Therefore, we have decided to devote this first issue of our new medical magazine to this problem, hoping that it will be a constructive step forward toward more intelligent, more extensive treatment of this severely disabled group."

#### POSITION CHANGES

Mr. Harold M. Robinson, President-Elect, has been transferred to the V. A. Hospital at Downey, Illinois, as Chief of Corrective Therapy. Johannes Timmerman, is to become Chief at the V. A. Hospital, Roanoke, Virginia.

#### CHAPTER ADVISORS ELECTED TO OFFICES

Jacob L. Rudd, M.D., Chief of the Department of Physical Medicine at Boston City Hospital and the VA Hospital, West Roxbury, was elected president of the New England Society of Physical Medicine at the annual meeting held recently in Boston. Elected First Vice-president was Dr. Fritz Friedland, Chief of the Physical Medicine Rehabilitation Service of the Cushing VA Hospital in Framingham, Massachusetts.

#### MALE AND FEMALE RECREATIONAL THERAPISTS NEEDED

Hospital Rehabilitation Department desires Recreational

Therapists, male and female for organization and direction of an activities program preparing psychiatric patients for return home, with instruction in leisure-time recreational outlets in the community. Would work as part of a research team in a controlled experiment in intensive rehabilitation. An excellent opportunity for a graduate student interested in research.

Submit statement of training and experience to Pilot Study Rehabilitation, Boston State Hospital, Dorchester Center Station, Boston 27, Massachusetts.

#### M.S. HOME ROUTINE MANUALS

The National Multiple Sclerosis Society has announced that four new manuals dealing with home programs for rehabilitation have been published and are in the process of distribution to M. S. patients throughout the United States.

The manuals were written by Dr. Edward E. Gordon, Medical Director of the institute for the Crippled and Disabled, and are the first of their kind to be printed.

Methods and equipment that a patient can use at home to perform exercise are clearly explained and illustrated with sketches. The all-important activities of daily living receive special attention.

"You still have a lot more ability than disability," is the message from Dr. Gordon to patients. Furthermore he advises that each patient work in close cooperation with his physician on his home program.

#### NEW BOOK BY DR. JOHN DAVIS

Of interest to all therapists and physicians working with neuropsychiatric patients is a new book by Dr. John E. Davis, "Clinical Applications of Recreational Therapy," published by Charles Thomas, Publisher, Springfield, Illinois.

#### MEETINGS OF PROFESSIONAL INTEREST

- |          |  |
|----------|--|
| November | American Vocational Association, Boston, Mass. Mr. M. D. Mobley, 1010 Vermont Ave. N.W., Washington, D.C., Chairman.     |
| November | American Speech and Hearing Association, Detroit, Mich. Mr. G. A. Kopp, Wayne University, Detroit 1, Michigan, Chairman. |
| Dec. 2   | Oklahoma Society for Crippled Children, Oklahoma City, Okla.   |
| Dec. 2-5 | Sixth Annual Clinical Session of the American Medical Association, Denver, Colorado.                                     |





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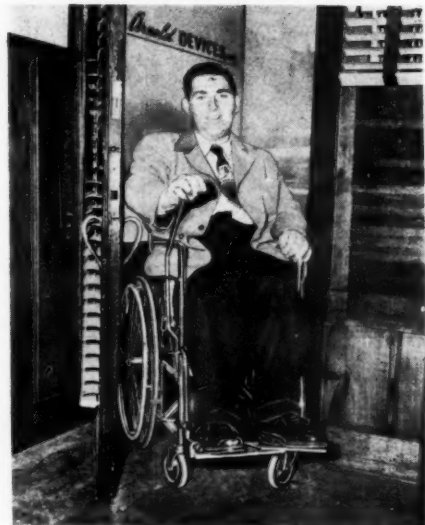


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### APPLICATION FOR ACTIVE MEMBERSHIP

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Address \_\_\_\_\_ Date \_\_\_\_\_  
Position \_\_\_\_\_ Location \_\_\_\_\_  
Education \_\_\_\_\_ Major \_\_\_\_\_ Degrees \_\_\_\_\_  
(college) (A major in Physical Education is required)  
Training and Experience in Physical Rehabilitation \_\_\_\_\_  
(One year under the direct supervision of a Medical Doctor is required)  
\_\_\_\_\_  
Signature of Applicant \_\_\_\_\_

### APPLICATION FOR ASSOCIATE MEMBERSHIP

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Gilbert 3-5709

Henry Ford,  
110 Lee Street,  
Modesto, Calif.  
Tel. 676 J

Physicians Supply Co.,  
2950 Telegraph Ave.,  
Oakland 9, Calif.  
Twinoaks 3-7825

Bischoff's Surgical House,  
166 South Second St.,  
San Jose 13, Calif.  
Cypress 35315

Bowers Ambulance Service,  
430 E. Pacific Coast Hwy.,  
Long Beach 6, Calif.  
Tel. 6-9703

Village Apothecary Shop  
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La Jolla, Calif.  
Tel. G-5-77-76

Jennings Surgical Supplies  
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Alpine-408

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Tel. 5-3631 — 8-5806

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Dowd Chair Rental & Sales  
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Miami 37, Florida  
Miami 2-6152

Smith Oxygen Service,  
131 S. Lakeside Dr.,  
Lake Worth, Florida  
Tel.—6633

Amedie Surgical Company  
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Miami 35, Florida  
Tel. 9-4533

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Ivy-1412

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Atlanta, Ga.

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Augusta, Ga.

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Sa. 2-0330

V. Mueller & Co.,  
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Chicago 12, Ill.  
Seeley 3-2180

Chicago Wheel Chair Co.,  
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Basil Moore  
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Marshall, Ill.  
Tel.—334

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Indianapolis 4, Ind.  
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Holyoke-4425

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Holyoke, Mass.

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Tel. 2-3230

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Mount Vernon 7-1886

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Monroe Surgical,  
93 Monroe Ave.,  
Rochester 7, N. Y.  
Hamilton 6710

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12-16 Spring St.,  
Rochester 14, N. Y.  
Locust 3053

Martin J. Nunn  
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Rome N. Y.  
Tel. 842

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Garfield 1700

Low Surgical Co., Inc.,  
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Flushing 54, N. Y.  
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Worth 2-4947

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Schenectady 4, N. Y.  
Tel. 2-7064

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Cleveland 3335

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New York 23, N. Y.  
Su 7-5200

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Winchester Surgical Supply Co.  
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Toledo 10, Ohio  
Adams 4123

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Telephone: WISconsin 7-5644

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10 Mill Street  
Paterson, New Jersey  
Telephone: MUIberry 4-5027

Keefe and Keefe, Inc.  
874 Lexington Ave.  
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Telephone TRaifaiga 9-1600

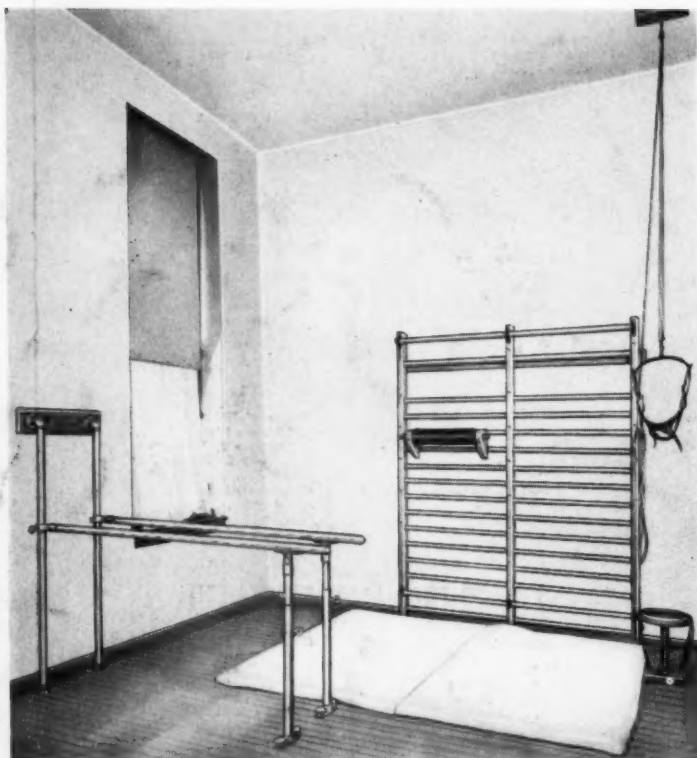
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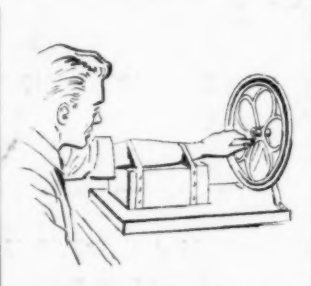
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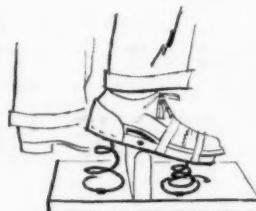
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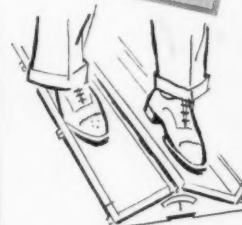
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